Applicable Country & Regions:

All Regions

Product Service Manual – Level 2

Service Manual for BenQ:
Projector/SX930
<9H.JEG77.15X>



Version: 00a
Date:2015/09/22

Notice:

For RO to input specific "Legal Requirement" in specific NS regarding to responsibility and liability statements.

Please check BenQ's eSupport web site, http://esupport.benq.com, to ensure that you have the most recent version of this manual.

First Edition (Sep., 2015)

Content Index

Update History

Revision	Chapter	Changes	Date
Rev. 00a		Initial version	2015/9/21

1. Abbreviations & Acronyms

A	
A/D	Analog to Digital
B	
BenQ	BenQ Corporation
C	
C/W	Color Wheel
CM	Concave Mirror
D	
DLP	Digital Light Processing / Texas Instruments®
DMD	Digital Micro mirror Device
DVI	Digital Video Interface
DVI-I	Digital Video Interface-Integrated
P	
PL	Projection Lens
POM	Pond of Mirrors
R	
RS232	Interface Between Data terminal Equipment and Data Communications Equipment Employing Serial Binary Data Interchange
S	
SVGA	Super Video Graphics Array, A screen resolution of 800 x 600 pixels.
SXGA	Super XGA. A screen resolution of 1280x1024 pixels.
V	
VGA	Video Graphics Array. A screen resolution of 640x480 pixels.
X	
XGA	A screen resolution of 1024x768 pixels.

2. About This Manual

This manual contains information about maintenance and service of BenQ products. Use this manual to perform diagnostics tests, troubleshoot problems, and align the BenQ product.

Important

Only trained service personnel who are familiar with this BenQ Product shall perform service or maintenance to it. Before performing any maintenance or service, the engineer MUST read the "Important Safety Information"

2.1 Trademark

The following terms are trademarks of BenQ Corporation:
BenQ

Other companies, products, or service names may be the trademarks of their respective companies.

2.2 Introduction

This section contains general service information, please read through carefully. It should be stored for easy access place.

2.3 Important Service Information

RoHS (2002/95/EC) Requirements – Applied to all countries require RoHS.

The RoHS (Restriction of Hazardous Substance in Electrical and Electronic Equipment Directive) is a legal requirement by EU (European Union) for the global electronics industry which sold in EU and some counties also require this requirement. Any electrical and electronics products launched in the market after June 2006 should meet this RoHS requirements. Products launched in the market before June 2006 are not required to compliant with RoHS parts. If the original parts are not RoHS complaints, the replacement parts can be non ROHS complaints, but if the original parts are RoHS compliant, the replacement parts MUST be RoHS complaints.
If the product service or maintenance require replacing any parts, please confirming the RoHS requirement before replace them.

2.4 Safety Notice

1 Make sure your working environment is dry and clean, and meets all government safety requirements.
2 Ensure that other persons are safe while you are servicing the product.
3 DO NOT perform any action that may cause a hazard to the customer or make the product unsafe.
4 Use proper safety devices to ensure your personal safety.
5 Always use approved tools and test equipment for servicing.
6 Never assume the product's power is disconnected from the mains power supply. Check that it is disconnected before opening the product's cabinet.
7 Modules containing electrical components are sensitive to electrostatic discharge (ESD). Follow ESD safety procedures while handling these parts.
8 Some products contain more than one battery. Do not disassemble any battery, or expose it to high temperatures such as throwing into fire or it may explode.
9 Refer to government requirements for battery recycling or disposal.

2.5 Compliance Statement

Caution: This Optical Storage Product contains a Laser device. Refer to the product specifications and your local Laser Safety Compliance Requirements.

2.6 General Descriptions

This Service Manual contains general information. There are 2 levels of service:
Level 1: Cosmetic / Appearance / Alignment Service
Level 2: Circuit Board or Standard Parts Replacement

2.7 Related Service Information

Service Web Site
eSupport Website:
    BenQer: http://esupport.benq.com/v2
    ASP: http://esupport.benq.com/

3. Product Overview

The projector consists of DLP projector controller, Lamp controller, Power supply system, and System cooling controller. The DLP controller captures digital PC data and video data and then converts them into the DMD display device. The Lamp controller dominates the lamp's power and synchronizes its frequency with color display sequence. The Power supply unit controls the AC line power factor and converts primary voltage to secondary low voltages for digital board. The System cooling controller drives the airflow to quench the lamp's heat and electrical component's heat.

- **Specification Overview**
  - Panel Information
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3.1 Specification Overview

● Specification Overview

<table>
<tr><td>SX930</td><td colspan="4">Version: 02</td></tr>
<tr><td>Item</td><td colspan="4">Specification</td></tr>
<tr><td colspan="5">1.Panel / Driver IC Information</td></tr>
<tr><td>1.1 Panel Type</td><td colspan="4">0.7"XGA 2xLVDS 14° Type DMD</td></tr>
<tr><td>1.2 Package Type</td><td colspan="4">Type A</td></tr>
<tr><td>1.3 Size</td><td colspan="4">0.7”</td></tr>
<tr><td>1.4 Pixels</td><td colspan="4">1024(H) x 768(V)</td></tr>
<tr><td>1.5 Color Depth</td><td colspan="4">30 Bits (1.07 Billion Colors)</td></tr>
<tr><td>1.6 Driver Type</td><td colspan="4">DDP 4421-HV</td></tr>
<tr><td>1.7 Panel Pixel Quality</td><td colspan="4">Follow TI spec. (Refer to Appendix 4)</td></tr>
<tr><td>1.8 Image Imperfection</td><td colspan="4">Follow TI spec. (Refer to Appendix 4)</td></tr>
<tr><td>1.9 LAN Drive Type</td><td colspan="4">Display : NA
Control : A-top</td></tr>
<tr><td colspan="5">2. Projection Lens Geometry Specification
Note: Projection Size for measurement as below: with mark ”*”
1. DMD Aspect ratio(16:9) ->projection size: 95 inch(diagonal) image size
2. DMD Aspect ratio(16:10) ->projection size: 87 inch(diagonal) image size
3. DMD Aspect ratio(4:3) >projection size: 78 inch diagonal) image size</td></tr>
<tr><td rowspan="2">2.1 F/#</td><td colspan="2">Wide</td><td colspan="2">Tele</td></tr>
<tr><td colspan="2">2.1</td><td colspan="2">2.63</td></tr>
<tr><td rowspan="2">2.2 Focal Length</td><td colspan="2">Wide:</td><td colspan="2">Tele:</td></tr>
<tr><td colspan="2">21.7 mm</td><td colspan="2">34.64 mm</td></tr>
<tr><td>2.3 Zoom Ratio</td><td colspan="4">1.6 ±2%</td></tr>
<tr><td>2.4 Throw Ratio</td><td colspan="4">1.5~2.4 (Wide 78” ±3% @ 2.38m)</td></tr>
<tr><td>2.5 True Zoom</td><td colspan="4">NA</td></tr>
<tr><td>2.6 H,V Offset*</td><td colspan="4"></td></tr>
<tr><td>2.6.1 Offset H(%)*</td><td colspan="4">0% ± 2.5% Appendix A.15)</td></tr>
<tr><td>2.6.2 Offset V(%)*</td><td colspan="4">default 107.5% ± 2.5% (Mode B, Appendix A.15)</td></tr>
<tr><td>2.6.3 Lens Shift(%)*</td><td colspan="4">Vertical shift: +5%@ at default 107.5%±2.5%
"+": lens shift upward
"-": lens shift downward</td></tr>
<tr><td>2.7 Focus Range (m)</td><td colspan="4">W: 1.86 ~ 9.32m T: 2.98 ~ 14.91 m</td></tr>
<tr><td>2.7.1 Screen Size (inch)</td><td colspan="4">60” ~ 300” (Check by E pattern, Appendix Pattern 6)</td></tr>
<tr><td>2.8 TV Distortion</td><td colspan="4">Wide & Tele <1%</td></tr>
<tr><td>2.9 Keystone Distortion</td><td colspan="4">Wide & Tele <1%</td></tr>
<tr><td>2.10 Screen Distortion*</td><td colspan="4">|A,B| <=5mm, |C|<=5.0 mm @ 78" at 107.5% V offset</td></tr>
<tr><td>2.11 Focus Quality*</td><td colspan="4"></td></tr>
<tr><td>2.11.1 ⊠ Pattern*</td><td colspan="4">(1) The pattern can be uniformly focused – then pass!
(2) If it’s difficult to judge, then check 2.11.2
Defocus/Flare judge criteria refer to Appendix A16/17</td></tr>
<tr><td>2.11.2</td><td>R</td><td colspan="2">G</td><td>B</td></tr>
<tr><td>Defocus (Maximum) *</td><td>2.5</td><td colspan="2">2.5</td><td>2.5</td></tr>
<tr><td>Flare (Maximum) *</td><td>3.5</td><td colspan="2">3.5</td><td>3.5</td></tr>
<tr><td rowspan="2">2.12 Lateral Color*</td><td></td><td colspan="2">Center Zone</td><td>All other area</td></tr>
<tr><td>R-G</td><td colspan="2"><2/3 pixel</td><td><1.0 pixel</td></tr>
</table>

	B-G	<2/3 pixel	<1.0 pixel	
	R-B	<1.0 pixel	<1.0 pixel	
2.13 DOF (Min. cm)	DOF 5 cm checked by E pattern. Refer to Appendix A24 "+" and"-" desinition "+":move projector backward to far away the screen and until focus limit. Record the backward distance(+) for the rear depth of focus.(後景深) "-":move projector forward to close to the screen and until focus limit. Record the backward distance(-) for the front depth of focus.(後景深)			
2.14 Zoom Ring Torque	200~650g follow Qisda Lens spec			
2.15 Focus Ring Torque	50~300g follow Qisda Lens spec			
2.16 Lens offset Position	115%出貨(SI Provide) *For Lens Shift Models.			
2.17 Zoom&Focus shaking level	Follow limit sample (When needed)			
2.18 Lens Shift Shaking(lock) Level	Lock level:5 Lens weight			
2.19 Lens Shift Speed(sec) (only for motorized len shift)	N.A.			
3.Optical Specification Test under " * " (diagonal) image size with Wide projection lens position.(base on lens best design value) Reference Meter: CL-200 Meter (SN head:81531011, body:82521013)				
3.1 ANSI Brightness	Normal: Minimum 6300 lm (environment>35℃ , MKT>6000 lm) Normal: Typ 6650 lm (For reference) ECO: Typ 5320 lm (For reference) Connect HDMI =Optical native(DMD-full-on) If no HDMI Source, measure PC Input ≧ 97% of Optical Native (DMD-full-on)			
3.2 ANSI (-) uniformity	Minimum -50%			
3.3 ISO Uniformity	Minimum 65%			
3.4 ANSI Contrast	Minimum 150:1			
3.5 FOFO Contrast	Minimum 1500:1 (WCE2), Refer to appendix4-A23			
3.6FOFO Contrast with DB	N.A.			
3.7 color wheel segment	70Y30W90C30B65G75			
3.8 color wheel speed	Data model:50Hz 2X 60Hz 2X			
3.9 Color Coordinate (Confirm at PVT stage)	Color	x	y	Δ(u',v')
	White	0.319±0.02	0.353±0.02	±0.03
	Red	0.637±0.04	0.357±0.04	±0.04
	Green	0.339±0.04	0.570±0.04	±0.04
	Blue	0.147±0.03	0.068±0.03	±0.04
3.10 Color Uniformity (Confirm at PVT stage)	Color	△uv		
	White	≦0.02		
	Red	≦0.03		
	Green	≦0.02		
	Blue	≦0.02		
3.11 Color Gamut(Compare to NTSC)	Data model: Typical 60%			
3.12 Light Leakage in AA	△≦0.5 lux compared with center point @ full black pattern within 60". This light-leakage is only described as the spot light with obvious shape. The uniformity difference of black pattern is			

	not included. (Except DMD Defect)	
3.13 Light Leakage out of AA	≦1 lux, @ full black pattern with 60”~80“ ≦3 lux, @ out of full black pattern with diagonal 80~120” ≦20 lux, @ out of full black pattern with diagonal >120” (Except DMD Defect and high zoom ex: D zoom /zoom5 / B zoom)	
3.14 Ghost	Ghost (Confirm at EVT2 stage)	
3.15 Defect (Color Band, Dark Corner, Dark band)	Follow limited sample (When needed).	
3.16 Preset mode setting		
4.Lamp Specification		
4.1 Lamp	USHIO NSH465W E22.7	
4.2 Lamp Sync Type	AC Lamp	
4.3 Lamp Flick	Follow limited sample (When needed).	
4.4 Lamp Power	Normal Mode	~~440W~~ -> 425W
	ECO Mode	360W
	Image-care or equivalent	NA
5. Mechanical Specification		
5.1 Color & Texture specifications	Refer to ID document for details	
5.2 Physical Dimensions(Width X Depth X Height)	446*336*152(mm)	
5.3 Net Weight	≦8.5kg	
5.4 Security Slot	Kensington compatible slot 20Kg break away force	
5.5 Lens Cover	Detached lens cover	
5.6 Adjustment Feet	Adjustable foot in front, rubber foot in rear. Front/ Rear foot **Tilt:** 0-4.5∘, **Right/Left:** +4.0∘/-4.0∘	
5.7 Ceiling Mounting	Match BenQ’s ceiling mount required. Use the same mounting as current shipping projectors.	
5.8 Screws	All color of screws should similar with the plastic color which close it.	
5.9 During PVT stage, limited sample of color and texture should be approved by BenQ industrial designer and mechanical engineer.	N/A	
5.10 Packaging Cushion Material	EPE	
6. Thermal Specification Mechanical component temperature at ambience 0~40℃		
6.1 Surface held or touched for short periods	Normal surface: Metal< 60 ℃ Plastic< 85 ℃ Bottom surface @25℃ Metal< 55 ℃ Plastic< 70 ℃	
6.2 Surface which my be touched	Metal	Plastic
	< 70 ℃	< 95 ℃
6.3 Exhaust Air	< 95 ℃	
6.4 Audible Noise Level	Typical	Normal mode: 39dBA @ 25°C(table center) Eco mode: 36dBA @ 25°C(table center)

	Max.	Normal mode : 41dBA @ 25°C(table center) Eco mode : 38dBA @ 25°C(table center)
6.5 Fan Numbers	7	
6.6 Sound Quality	1K~20K < 9dB (follow ECMA-74)	
6.7 Auto Blank distance	NA	
7.0 Power Requirements		
7.1 Power Supply (Normal)		
7.2 Power consumption	Max.	645W
	Standby	0.5W Max. at 100 ~ 240VAC (disable loop through, Lan function)
		3W MAX at 230VAC 50HZ for network mode
	Normal	Typical 610W @110Vac
	ECO	Typical 564W@110Vac
	ECO Blank	Same as Eco Mode
7.3 Power Connector	IEC 60320 C14	
7.4 Power Switch	No	
8.0 Compatibility		
8.1 Data Compatibility (Version 03)		
8.1.1 RGB Digital	Refer to 2.1.4 HDMI/DVI Input	
8.1.2 RGB Analog	Refer to 2.1.5 PC Input	
8.1.3 Macintosh	MAC 13/16/19/21	
8.2 Video Compatibility		
8.2.1 SDTV	480i/576i	
8.2.2 EDTV	480P/576P	
8.2.3 HDTV	720@50P/60P,1080@50i/60i/24p/25p/30p/50p/60p	
8.2.4 Video	NTSC/ NTSC4.43/ PAL (Including PAL-M, PAL-N)/ SECAM/ PAL60/	
8.3 Frequency		
8.3.1 H-Sync	15~102KHz	
8.3.2 V-Sync	23 ~ 120 Hz	
8.4 DDC	EDID 1.3	
9.0 User Interface		
9.1 Operator Keypad	10 Keys (Same as SU922) Power ; Source ;Auto ; Blank ; Mode/Enter ; Menu/Exit ; Right (Keystone ◀) ; Left (Keystone ▶) ; Up(Keystone+) ; Down(Keystone-)	
9.2 LED Indicators	3 LEDS	
9.2.1 Power On/Off Status	Refer to 4.4 LED definition	
9.2.2 Lamp Status	Refer to 4.4 LED definition	
9.2.3 Temperature Status	Refer to 4.4 LED definition	
9.3 Electric Keystone	Horizontal keystone and adjustable range ±30° Vertical keystone and adjustable range ±30°	
9.4 Remote Control	5F.261W9.211 (WW SKU) / 5F.261W9.151 (J SKU)	
10.0 Regulatory		
10.1 Safety	Vendor : Refer to RFQ Internal : Refer to B106 document	
10.2 EMC	Vendor : Refer to RFQ Internal : Refer to B106 document	
10.3 ESD	Follow IEC 61000-4-2 and EN55024 regulation	

10.4 GP	1) BenQ Restriction of Hazardous Substance Guideline (SUP-QM-07-02) 2) Other GP control items please refer PRR
11.0 Reliability	
11.1 MTBF	40000 hours except DMD chip, Color wheel, Lamp and Fan, Ballast
11.2 Lamp Lifetime	1). Lamp hour = Total lamp hour= X(hours used in Normal mode) + Y(hours used in Eco mode) X= lamp life spec of Eco/lamp life spec of Normal mode Y= lamp life spec of Eco/lamp life spec of Eco mode
11.2.1 Normal Mode	2000 hrs(Lamp only)
11.2.2 ECO Mode	2500 hrs(Lamp only)
11.2.3 Smart Eco Mode (ImageCare)	NA
11.2.4 Smart Eco Mode (LampCare)	NA
11.2.5 Image life (Lumen Care)	NA
12.0 Other Feature	
12.1 Color Temperature at Normal (sRGB mode)	5500/6500/7500
12.2 Digital Zoom	NA
12.3 Aspect Ratio	Auto/Real/4:3/16:9/16:10
12.4 Projection Methods	Floor Front/Ceiling Front/Floor Rear/Ceiling Rear
12.5 3D Display	Yes, support DLP 3D
12.6 LAN	
12.6.1 LAN-Crestron eControl	YES
12.6.2 LAN-RoomView compatible	YES
12.6.3 LAN-PJ Link compatible	YES
12.6.4 LAN-AMX compatible	YES
12.6.5 LAN-Display(1 to many) (4 to 1)	No
12.6.6 LAN over RS23 (Follow RS232 command)	YES
12.7 Certificate	
12.7.1 Win8 Certificate	YES
12.7.2 Crestron Certificate	NA
12.7.3 WEEE Certificate	NA
12.7.4 DTS Certificate	No
12.7.5 HDMI Certificate	NA
12.7.6 MHL Certificate	NA
12.8 WCE3.0	NA
12.9 Screen Saver Mode (Eco Blank & Lamp Saver)	Turn on Eco Blank: 1. When user presses the button once, the image would turn toEco Blank mode and show "Blank" and other words in the bottom of screen. 2. The lamp power will dim to Lamp Dimmest Power (follow Lamp Capability). Turn off Eco Blank:

	1. When the image is in Eco Blank mode and user done: (1) Press any Keypad (2) Press IR The projector would turn off Eco Blank mode The lamp power will back to original mode power
	Turn on Lamp Saver: 1. When there is no signal input and didn't do any projector operation last to 3 mins, a full black pattern will be displayed with "No signal" and other message The lamp power will dim to Eco Blank (follow Lamp Capability).
	Turn off Lamp Saver: 1. When the image is in Lamp Saver mode and user done: (1) Press any Keypad (2) Input Signal (3) Press IR The projector would turn off Lamp Saver mode The lamp power will back to original mode power
12.10 Smart ECO*	NA
12.11 Off-line cooling	NA
13.0 Green Eco design	
13.1BenQ ecoFACTS	Refer to BenQ ecoFACTS Checkinglist

Note: Follow USHIO Lamp Operating.

Input / Output Connectors

1.Input Terminals	
1.1 Computer Input - 1	RGB DB-15 x 1 (shared with Component 1)
1.2 Computer Input - 2	NA
1.3 Video	Composite Video (RCA X 1)
1.4 S-Video	S-Video (Mini Din) X 1
1.5 Component - 1	shared with computer 1
1.6 Component - 2	NA
1.7 DVI - 1	NA
1.8 DVI - 2	NA
1.9 HDMI Digital Video – 1	HDMI version: 1.4x1/ HDCP version: 1.4 / MHL2.1
1.9.1 Support Audio Input	YES
1.9.2 CEC control	No
1.9.3 HDMI Receive Distance	Auditorium model (Deep color 10bit:AWG26 30m)
1.10 HDMI Digital Video – 2	HDMI version: 1.4x1 HDCP version: 1.4
1.10.1 Support Audio Input	YES
1.10.2 CEC control	No
1.11 Audio Input – 1 (RCA R &L)	RCA Audio Jack right and left
1.11.1 Related Source	Video/S-Video audio input
1.12 Audio Input – 2 (Mini Jack)	Φ3.5mm Stereo Mini-Jack x 1
1.12.1 Related Source	Computer / Component audio input
1.12.2 Input Signal Level	500mVrms 10 KΩ
1.13 Audio Input – 3 (Mini Jack)	Microphone x1
1.14 Audio Input – 4 (Mini Jack)	NA
1.15 USB Input	NA
1.16 LAN input	RJ45 LANx1 (Control only)
2.Output Terminals	
2.1 Computer Output	RGB DB-15 x 1 (Female Type)
2.1.1 Signal Source	loop through Computer Input -1
2.2 Audio Output	Φ3.5mm Mono Mini-Jack x 1
2.2.1 Signal Source	Audio Input-1 / Audio Input-2/ Power on/off Ring Tone/HDMI audio/Microphone
2.3 Speaker	10W X 2
2.3.1 Amplifier	10W per Channel @THD<=10%
3.Control Terminals and Interface	
3.1 IR Receiver	IR Receiver x2 (Front, Rear)
3.1.1 Angle	±30°
3.1.2 Distance	0~8m
3.2 USB	
3.2.1 Mini-USB B	
3.2.1.1 FW Upgrade	Yes
3.2.1.2 Mouse Control	NA
3.2.1.3 USB Display	NA
3.2.1.4 output current	NA
3.2.2 USB A	
3.2.2.1 Output current	Just only supply 5V @ 1.5A
3.3 RS-232	D-Sub 9 Pins x 1, male Type
3.3.1 FW Upgrade	Yes

3.3.2 Control Command	Yes
3.4 Lan Control	RJ-45 x1. Follow IEEE802.3u
3.5 12V Trigger (Screen Control)	DC power jack(standby mode is off)
3.5.1 Driving Power	Output 12V, 500mA max
3.5.2 Overload Protection	< 1A
3.6 Wired Remote Control	No

Accessories

1.Accessory	
1. Power Cord 1.8m	X1
2.VGA Cable 1.8m	X1
3. CD x 1 (22 Language)	X 1
4. Quick-Start_Card (18Language)	X 1
5. Remote Control	5F.261W9.211 (WW SKU) / 5F.261W9.151 (J SKU)
6. Carry Case	N/A
7.Warranty Card	By SKU
8.Adapter	N/A

Environmental

1.Environmental		
1.1 Temperature	Operating	0~40°C, without condensation
	Storage	-20~60°C, without condensation
1.2 Humidity	Operating	10~90%RH, without condensation
	Storage	10~90%RH, without condensation
1.3 Altitude	Operating	Without high altitude mode 0°C~35°C @ 0~1499m above sea level With high altitude mode 0°C~30°C @ 1500~3000m above sea level
	Storage	30℃@0~12,200m above sea level

Electrical Specification

1.1 Electrical Interface Character
1.1.1 Composite Video Input
(1) Pin definition (RCA Jack)



(2) Signal Level:

Signal	Parameter	Min	Type	Max	
CVBS Luminance	Amplitude, total (video+ sync)		1		Volts peak to peak
	Amplitude, video		0.7		Volts peak to peak
	Amplitude, sync		0.3		Volts peak to peak
	Impedance		75		ohm

(3) Support Timings: (Version 05)

Video mode	Horizontal frequency (KHz)	Vertical frequency (Hz)	Sub-carrier Frequency (MHz)	User Manual Supported	3D Field Sequential
NTSC	15.73	60	3.58	Yes	◎
PAL	15.63	50	4.43	Yes	
SECAM	15.63	50	4.25 or 4.41	Yes	
PAL-M	15.73	60	3.58	Yes	
PAL-N	15.63	50	3.58	Yes	
PAL-60	15.73	60	4.43	Yes	
NTSC4.43	15.73	60	4.43	Yes	

1.1.2 S-Video Input

(1) Pin definition (Mini Din)



4-pin Mini Din Connector

(2) Signal Level:

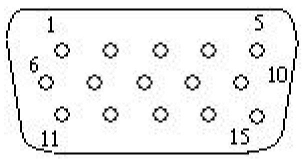
PIN	Signal	Parameter	Min	Type	Max	
1	GND					
2	GND					
3	CVBS Luminance	Amplitude, total (video+ sync)		1		Volts peak to peak
		Amplitude, video		0.7		Volts peak to peak
		Amplitude, sync		0.3		Volts peak to peak
		Impedance		75		ohm
4	CVBS Luminance	Amplitude (for NTSC)		286		m Volts peak to peak
		Amplitude (for PAL/SECAM)		300		m Volts peak to peak
		Impedance		75		ohm

(3) Support Timings: (Version 05)

Video mode	Horizontal frequency (KHz)	Vertical frequency (Hz)	Sub-carrier Frequency (MHz)	User Manual Supported	3D Field Sequential
NTSC	15.73	60	3.58	Yes	◎
PAL	15.63	50	4.43	Yes	
SECAM	15.63	50	4.25 or 4.41	Yes	
PAL-M	15.73	60	3.58	Yes	
PAL-N	15.63	50	3.58	Yes	
PAL-60	15.73	60	4.43	Yes	
NTSC4.43	15.73	60	4.43	Yes	

1.1.3 Component Video Input

(1) Pin definition { RGB DB-15 x 1 (Female Type) }



(2) Signal Level:

Pin	Signal	Parameter	Min	Type	Max	
1	Pr DATA	Impedance		75		Ohm
3	Pb DATA	Black pedestal		0		Volts
2	Y DATA_SOG	Impedance		75		Ohm
		Amplitude		1		Volts peak-to-peak
		Video amplitude		0.7		Volts peak-to-peak
		Sync amplitude		0.3		Volts peak-to-peak
		Black pedestal		0		Volts
6	Red GND					
7	Green GND					
8	Blue GND					

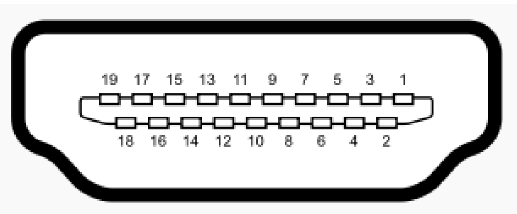
Support Timings: (Version 05)

Timing	Resolution	Horizontal frequency (KHz)	Vertical Frequency (Hz)	Dot Clock Frequency (MHz)	User Manual Supported	3D Field Sequential
480i	720 x 480	15.73	59.94	13.5	Yes	◎
480p	720 x 480	31.47	59.94	27	Yes	◎
576i	720 x 576	15.63	50	13.5	Yes	
576p	720 x 576	31.25	50	27	Yes	
720/50p	1280 x 720	37.5	50	74.25	Yes	
720/60p	1280 x 720	45.00	60	74.25	Yes	◎
1080/50i	1920 x 1080	28.13	50	74.25	Yes	
1080/60i	1920 x 1080	33.75	60	74.25	Yes	
1080/24P	**1920 x 1080**	**27**	**24**	**74.25**	Yes	
1080/25P	**1920 x 1080**	**28.13**	**25**	**74.25**	Yes	
1080/30P	**1920 x 1080**	**33.75**	**30**	**74.25**	Yes	
1080/50P	1920 x 1080	56.25	50	148.5	Yes	
1080/60P	1920 x 1080	67.5	60	148.5	Yes	

1.1.4 BNC *5 Input (RGBHV) ➔ NA

1.1.5 HDMI/DVI/MHL* Input
- HDMI 1.4 Compliance
- DVI 1.0 Compliance
- HDCP 1.4 Compliance
- MHL 2.1 Compliance

(1) Pin definition



Type A (Female) HDMI

Pin	HDMI Signal	MHL Signal
1	TMDS Data2+	N/C
2	TMDS Data2 Shield	CD_SENSE
3	TMDS Data2–	N/C
4	TMDS Data1+	N/C
5	TMDS Data1 Shield	TMDS_GND
6	TMDS Data1–	N/C

7	TMDS Data0+	MHL+
8	TMDS Data0 Shield	MHL Shield
9	TMDS Data0–	MHL—
10	TMDS Clock+	N/C
11	TMDS Clock Shield	TMDS_GND
12	TMDS Clock–	N/C
13	CEC	N/C
14	Reserved (N.C. on device)	N/C
15	SCL	CD_PULLUP
16	SDA	N/C
17	DDC/CEC Ground	VBS_CBUS_GND
18	+5 V Power (max 50 mA)	VBUS
19	Hot Plug Detect	CBUS

(2) Support Video Timings: (Version 05)

Timing	Resolution	Horizontal frequency (KHz)	Vertical frequency (Hz)	Dot Clock Frequency (MHz)	User Manual Supported	3D Field Sequential	3D frame packing	3D over-under	3D side-by-side
480i *	720(1440) x 480	15.73	59.94	27	Yes	◎			
480p	720 x 480	31.47	59.94	27	Yes	◎			
576i *	720(1440) x 576	15.63	50	27	Yes				
576p	720 x 576	31.25	50	27	Yes				
720/50p	1280 x 720	37.5	50	74.25	Yes		◎	◎	◎
720/60p	1280 x 720	45.00	60	74.25	Yes	◎	◎	◎	◎
1080/24P	**1920 x 1080**	**27**	**24**	**74.25**	Yes		◎	◎	◎
1080/25P	**1920 x 1080**	**28.13**	**25**	**74.25**	Yes				
1080/30P	**1920 x 1080**	**33.75**	**30**	**74.25**	Yes				
1080/50i	1920 x 1080	28.13	50	74.25	Yes				◎
1080/60i	1920 x 1080	33.75	60	74.25	Yes				◎
1080/50P	1920 x 1080	56.25	50	148.5	Yes			◎	◎
1080/60P	1920 x 1080	67.5	60	148.5	Yes			◎	◎

Note :

MHL Not support 3D format.

* means the video format timing shall be transmitted using pixel repetition. The "pixel per line" count is show according to the syntax used in EIA/CEA-861E.

(3) Support PC Timings: (Version 05)

Resolution	Mode	Refresh rate (Hz)	H-frequency (kHz)	Clock (MHz)	User Manual Supported	3D Field Sequential	3D over-under	3D side-by-side
640 x 480	VGA_60	59.940	31.469	25.175	Yes	◎	◎	◎
	VGA_72	72.809	37.861	31.500	Yes			
	VGA_75	75.000	37.500	31.500	Yes			
	VGA_85	85.008	43.269	36.000	Yes			
	~~VGA_120**~~	~~119.518~~	~~61.910~~	~~52.500~~	~~Yes~~			
720 x 400	720x400_70	70.087	31.469	28.3221	Yes			
800 x 600	SVGA_60	60.317	37.879	40.000	Yes	◎	◎	◎
	SVGA_72	72.188	48.077	50.000	Yes			
	SVGA_75	75.000	46.875	49.500	Yes			

	SVGA_85	85.061	53.674	56.250	Yes			
	SVGA_120 (Reduce Blanking)	119.854	77.425	83.000	Yes	◎		
1024 x 768	XGA_60	60.004	48.363	65.000	Yes	◎	◎	◎
	XGA_70	70.069	56.476	75.000	Yes			
	XGA_75	75.029	60.023	78.750	Yes			
	XGA_85	84.997	68.667	94.500	Yes			
	XGA_120 (Reduce Blanking)	119.989	97.551	115.500	Yes	◎		
1152 x 864	1152 x 864_75	75.00	67.500	108.000	Yes			
1024x576	BenQ Notebook Timing	60.00	35.820	46.996	Yes			
1024x600	BenQ Notebook Timing	64.995	41.467	51.419	Yes			
1280x720	1280 x 720_60	60	45.000	74.250	Yes	◎	◎	◎
	1280x720_120	120	90.000	148.500	No	◎		
1280 x 768	1280 x 768_60 (Reduce Blanking)	60	47.396	68.25	No	◎	◎	◎
	1280 x 768_60	59.870	47.776	79.5	Yes	◎	◎	◎
1280 x 800	WXGA_60	59.810	49.702	83.500	Yes	◎	◎	◎
	WXGA_75	74.934	62.795	106.500	Yes			
	WXGA_85	84.880	71.554	122.500	Yes			
	WXGA_120 (Reduce Blanking)	119.909	101.563	146.25	Yes	◎		
1280 x 1024	SXGA_60	60.020	63.981	108.000	Yes		◎	◎
	SXGA_75	75.025	79.976	135.000	Yes			
	SXGA_85	85.024	91.146	157.500	Yes			
1280 x 960	1280 x 960_60	60.000	60.000	108	Yes		◎	◎
	1280 x 960_85	85.002	85.938	148.500	Yes			
1360 x 768	1360 x 768_60	60.015	47.712	85.500	Yes		◎	◎
1440 x 900	WXGA+_60 (Reduce Blanking)	60	55.469	88.75	No		◎	◎
	WXGA+_60	59.887	55.935	106.500	Yes		◎	◎
1400X1050	SXGA+_60	59.978	65.317	121.750	Yes		◎	◎
1600x1200	UXGA	60.000	75.000	162.000	Yes		◎	
1680x1050	1680x1050_60 (Reduce Blanking)	59.883	64.674	119.000	No		◎	◎
	1680x1050_60	59.954	65.290	146.250	Yes		◎	◎
640x480 @67Hz	MAC13	66.667	35.000	30.240	Yes			
832x624 @75Hz	MAC16	74.546	49.722	57.280	Yes			
1024x768 @75Hz	MAC19	75.020	60.241	80.000	Yes			
1152x870 @75Hz	MAC21	75.06	68.68	100.00	Yes			
1920x1080 @60HZ	1920X1080_60 (Reduce Blanking)	60	67.5	148.5	Yes			
1920x1200@60HZ	1920X1200_60 (Reduce Blanking)	59.95	74.038	154	Yes			
1920X1080(VESA)	1920X1080_60 (for Auditorium model)	59.963	67.158	173	no			

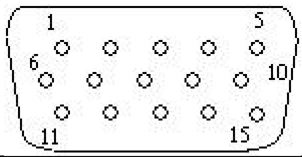
(4) Support Audio:
(a) HDMI Mode:
- Support LPCM, two audio channels
- Support audio sampling rate : 32kHz, 44.1kHz, 48kHz
- Support audio bit rate : 16 bits, 20 bits, 24 bits

(b)MHL mode:
-Support LPCM, two audio channels (follow IEC 60958 and IEC 61937)
-Support audio sampling rate : 32kHz, 44.1kHz, 48kHz
- Support audio bit rate : 16 bits, 20 bits, 24 bits

(C) DVI Mode:
Analog audio is supported through PC audio input terminal.
Note. There timing showing depend the EDID file and VGA graphic card limitation.
It is possible that user cannot choose the above timings on VGA display card.

1.1.6 PC Input

(1) Pin definition and Signal Level:



Pin	Signal	Parameter	Min	Type	Max	
1	RDATA	Impedance		75		Ohm
2	GDATA	Amplitude		0.7		Volts peak-to-peak
3	BDATA	Black pedestal		0		Volts
		Pixel Clock		170		M Hz
2	GDATA_SOG	Impedance		75		Ohm
		Amplitude		1		Volts peak-to-peak
		Video amplitude		0.7		Volts peak-to-peak
		Sync amplitude		0.3		Volts peak-to-peak
		Black pedestal		0		Volts
		Pixel Clock		170		M Hz
13	HDATA	Impedance		1		K ohm
		Amplitude, low level	0		0.5	volt
		Amplitude, high level	2.5		5	Volt
		Frequency	31		102	K Hz
14	VDATA	Impedance		1		K ohm
		Amplitude, low level	0		0.8	volt
		Amplitude, high level	2.5		5	Volt
		Frequency	48		120	Hz
12	SDADATA	Amplitude, low level	0		0.8	volt
		Amplitude, high level	2.5		5	Volt
15	SCLDATA	Amplitude, low level	0		0.8	volt
		Amplitude, high level	2.5		5	Volt
4	NC					
5	NC					
6	Red GND					
7	Green GND					
8	Blue GND					
9	DDCP 5V			5		Volts
10	Sync. Return					
11	GND					
2	G DATA Share with Y	Amplitude (with sync)		1		Volts peak to peak
		Impedance		75		ohm
1	R DATA Share with Pr	Amplitude		0.7		Volts peak to peak
		Impedance		75		ohm
3	B DATA Share with Pb	Amplitude		0.7		Volts peak to peak
		Impedance		75		ohm

(2) Support PC Timings: (Version 05)

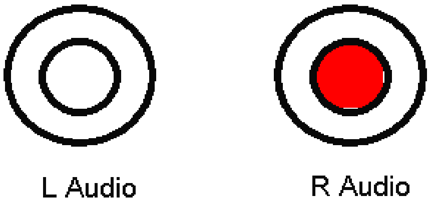
Resolution	Mode	Refresh rate (Hz)	H-frequency (kHz)	Clock (MHz)	User Manual Supported	3D Field Sequential	3D over-under	3D side-by-side
720 x 400	720x400_70	70.087	31.469	28.3221	Yes			
640 x 480	VGA_60	59.940	31.469	25.175	Yes	◎	◎	◎
	VGA_72	72.809	37.861	31.500	Yes			
	VGA_75	75.000	37.500	31.500	Yes			
	VGA_85	85.008	43.269	36.000	Yes			
	~~VGA_120**~~	~~119.518~~	~~61.910~~	~~52.500~~	~~Yes~~			
800 x 600	~~SVGA_56~~	~~56.250~~	~~35.156~~	~~36.000~~	~~Yes~~			
	SVGA_60	60.317	37.879	40.000	Yes	◎	◎	◎
	SVGA_72	72.188	48.077	50.000	Yes			
	SVGA_75	75.000	46.875	49.500	Yes			
	SVGA_85	85.061	53.674	56.250	Yes			
	SVGA_120 (Reduce Blanking)	119.854	77.425	83.000	Yes	◎		
1024 x 768	XGA_60	60.004	48.363	65.000	Yes	◎	◎	◎
	XGA_70	70.069	56.476	75.000	Yes			
	XGA_75	75.029	60.023	78.750	Yes			
	XGA_85	84.997	68.667	94.500	Yes			
	XGA_120 (Reduce Blanking)	119.989	97.551	115.500	Yes	◎		
1152 x 864	1152 x 864_75	75.00	67.500	108.000	Yes			
1024 x 576	BenQ NB Timing	60.0	35.820	46.966	Yes			
1024 x 600	BenQ NB Timing	64.995	41.467	51.419	Yes			
1280x720	1280 x 720_60	60	45.000	74.250	Yes	◎	◎	◎
	1280x720_120	120	90.000	148.500	No	◎		
1280 x 768	1280 x 768_60 (Reduce Blanking)	60	47.396	68.25	No	◎	◎	◎
	1280 x 768_60	59.870	47.776	79.5	Yes	◎	◎	◎
1280 x 800	WXGA_60	59.810	49.702	83.500	Yes	◎	◎	◎
	WXGA_75	74.934	62.795	106.500	Yes			
	WXGA_85	84.880	71.554	122.500	Yes			
	WXGA_120 (Reduce Blanking)	119.909	101.563	146.25	Yes	◎		
1280 x 1024	SXGA_60	60.020	63.981	108.000	Yes		◎	◎
	SXGA_75	75.025	79.976	135.000	Yes			
	SXGA_85	85.024	91.146	157.500	Yes			
1280 x 960	1280 x 960_60	60.000	60.000	108	Yes		◎	◎
	1280 x 960_85	85.002	85.938	148.500	Yes			
1360 x 768	1360 x 768_60	60.015	47.712	85.500	Yes		◎	◎
1440 x 900	WXGA+_60 (Reduce Blanking)	60	55.469	88.75	No		◎	◎
	WXGA+_60	59.887	55.935	106.500	Yes		◎	◎
1400X1050	SXGA+_60	59.978	65.317	121.750	Yes		◎	◎
1600x1200	UXGA	60.000	75.000	162.000	Yes		◎	◎
1680 x 1050	1680x1050_60 (Reduce Blanking)	59.883	64.674	119.000	No		◎	◎
	1680x1050_60	59.954	65.290	146.250	Yes		◎	◎
640x480 @67Hz	MAC13	66.667	35.000	30.240	Yes			
832x624 @75Hz	MAC16	74.546	49.722	57.280	Yes			

1024x768 @75Hz	MAC19	74.93	60.241	80.000	Yes			
1152x870 @75Hz	MAC21	75.06	68.68	100.00	Yes			
1920x1080 @60HZ	1920X1080_60 (Reduce Blanking)	60	67.5	148.5	Yes			
1920x1200@60HZ	1920X1200_60 (Reduce Blanking)	59.95	74.038	154	Yes			
1920X1080(VESA)	1920X1080_60 (for Auditorium model)	59.963	67.158	173	no			

Note. There 3D timing showing depend the EDID file and VGA display card. It is possible that user cannot choose the above 3D timings on VGA display card.

1.1.7 Audio Input (RCAx2)

(1) Pin definition :

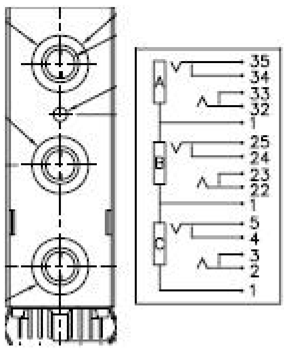


(2) Signal Level: N/A

PIN	Signal	Parameter	Min	Type	Max	
1	L Audio	Amplitude		0.5	2	VRMS
		Impedance	10			KΩ
2	R Audio	Amplitude		0.5	2	VRMS
		Impedance	10			KΩ

1.1.8 Audio Input (Mini-Jack φ3.5mm)

(1) Pin definition

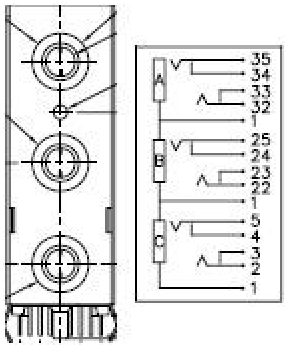


(2) Signal Level:

PIN	Signal	Parameter	Min	Type	Max	
1	GND					
2	Audio In Left	Amplitude		0.5	2	VRMS
		Impedance	10			KΩ
3	NC					
4	NC					
5	Audio In Right	Amplitude		0.5	2	VRMS
		Impedance	10			KΩ

1.1.9 Audio Headphone Output (Phone-Jack φ3.5mm)

(1) Pin definition

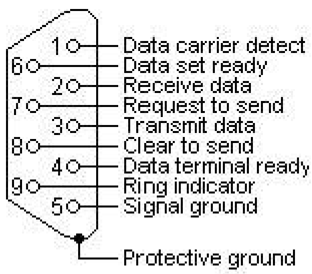


(2) Signal Level:

PIN	Signal	Parameter	Min	Type	Max	
25	Audio Out Right	Amplitude	400	500	600	mV (when input = 500mVrms , volume maximum and Measurement on 10kohm loading)
		Load Impedance	32	10kohm		Ω
23/24	Audio out detect	Output ON			0.2	VDD
		Output Off	0.8			VDD
22	Audio Out Left	Amplitude	400	500	600	mV (when input = 500mVrms , volume maximum and Measurement on 10kohm loading)
		Impedance	32	10kohm		Ω

1.1.10 RS232 Control Port

(1) Pin definition (D-Sub 9 Pin)

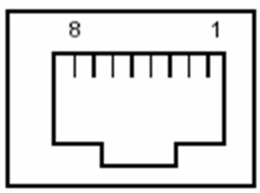


(2) Signal Level:

PIN	Signal	Parameter	Min	Type	Max	
1	NC					
2	RX	Amplitude (with sync)	-25		25	Volt
3	TX	Amplitude	-13.2		13.2	Volt
4	NC					
5	GND					
6	NC					
7	RTSZ					
8	CTSZ					
9	NC					

1.1.11 Lan Control Port (Follow IEEE 802.3)

(1) Pin definition(speed:10M/100M)

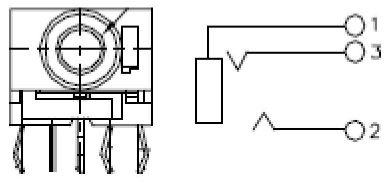


(2) Signal Level:

PIN	Signal
1	TD+
2	TD-
3	RD+
4	Common Mode Termination
5	Common Mode Termination
6	RD-
7	Common Mode Termination
8	Common Mode Termination

Lan LED information for A-Top :
LED define as following:
Green => Link LED . Solid on , Network connection is normally.
Yellow => Operation LED
Flash, 4 sec on/off, MCU is working normally.
Flash 0.5 sec on/off, FW Download mode.

1.1.12 Screen control output (3.5mm jack)



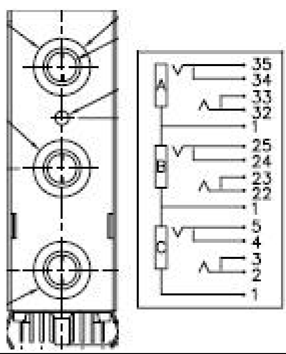
(2) Signal Level:

PIN	Signal	Parameter	Min	Type	Max	
2	DC	Amplitude			12	V
		Current			500	mA
3	Ring					
1	GND					

(2) Overload Protection:
- Reversible Fuse.

Signal	Parameter	Min	Type	Max	
I hode				0.5	A
I trip		1.0			A

1.1.13 Microphone



Pin	Pin Define
33/35	GND
32	Mic_Hot_in
34	MIC_DET

1.2 Speaker

Signal	Parameter	Min	Type	Max	
Audio	Impedance (audio in)		10		Kohm
	Amplitude (audio in)		500		mVolts rms
	Bandwidth	300Hz		16kHz	
	S/N Ratio	**40**			**dB**
	Total Harmonic Distortion			10	%

Power Supply Specification

1.1 Input Power Specification

Specification	Description
Input Voltage Range	The unit shall meet all the operating requirements with the range 90 ~ 264 VAC
Frequency Range	The unit shall meet all the operating requirements with an input frequency range 47 Hz ~ 63 Hz
Regulation Efficiency	80 % (typical) measuring at 115Vac and full load

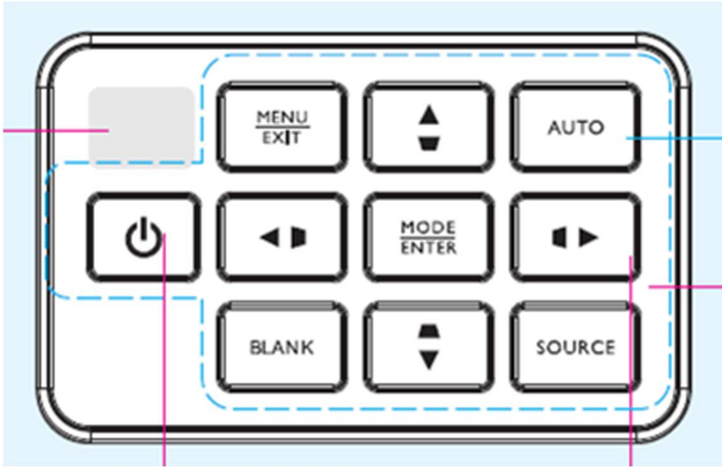
1.2 Varistor Requirement
The power supply's varistor component should stand 510V or higher power.

1.3 Lamp Power Requirement

Specification	Description
Starting pulse from Igniter	3.5kV

UI Specification

Keypad Description



Key Action Definition

Key Name	Detailed Description
Left/Keystone	1.When user press the button once, it will decrease the keystone horizontal value
	2. If there is SOD menu, user can press this key to move to the left item
Right/Keystone	1.When user press the button once, it will increase the keystone horizontal value
	2.When there is OSD menu, user can press this key to move to right item
Up/Keystone+	1.When user presses the bottom once, it will increase the vertical keystone value
	2.When there is OSD menu, user can press this key to move to upper item
Down/Keystone-	1.When user presses this bottom once, it will decrease the vertical keystone value
	2.When there is OSD menu, user can press this key to move to next item
Source	Switch to next source
Power	1. User presses this key once to turn on projector
	2.When projector is on, user should press this key once and show confirm message; then user should press "Power" key again to turn off projector (LED would be blink orange)
Auto	Auto adjusts the most suitable frequency, phase, for the input source. User could get the optimal projection quality by pressing the button. Auto-Adjustment function will not influence the color or brightness setting by users. "Auto" will only be active on PC (VGA) source.
Blank	This button will turn projector into/out of blank mode.
Mode/Enter	1.When there is no OSD menu, this button is Mode hot key, user would press this button to choose one of preset modes.
	2.When there is confirm message, user could press this key to confirm
Menu/Exit	1. User could press this bottom to call out OSD
	2.When it exits OSD, user could press this bottom to leave current page or items or to close OSD.

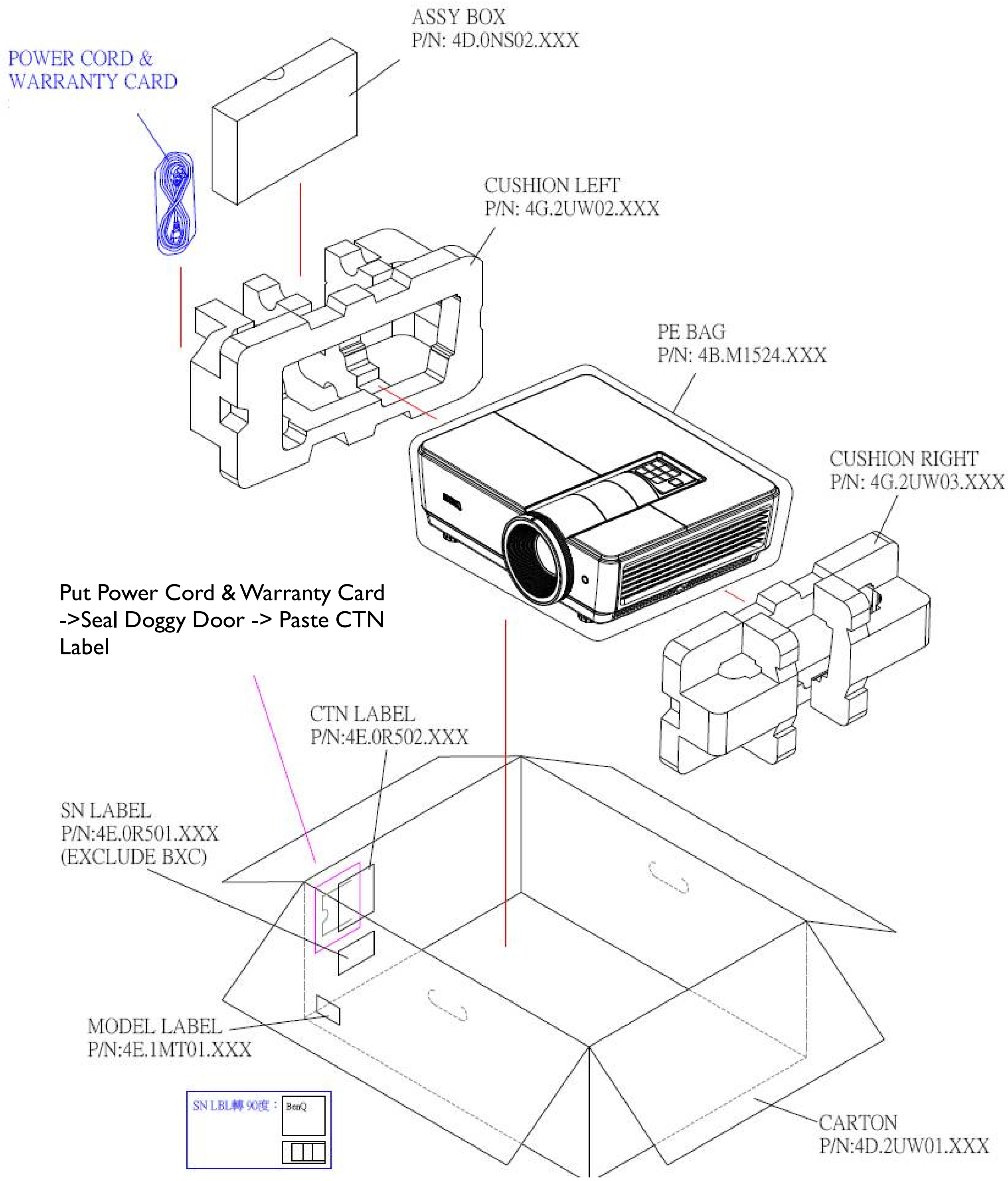
Remote Control Function and Key Code Definition (Detail See Appendix2)



3.2 Packing

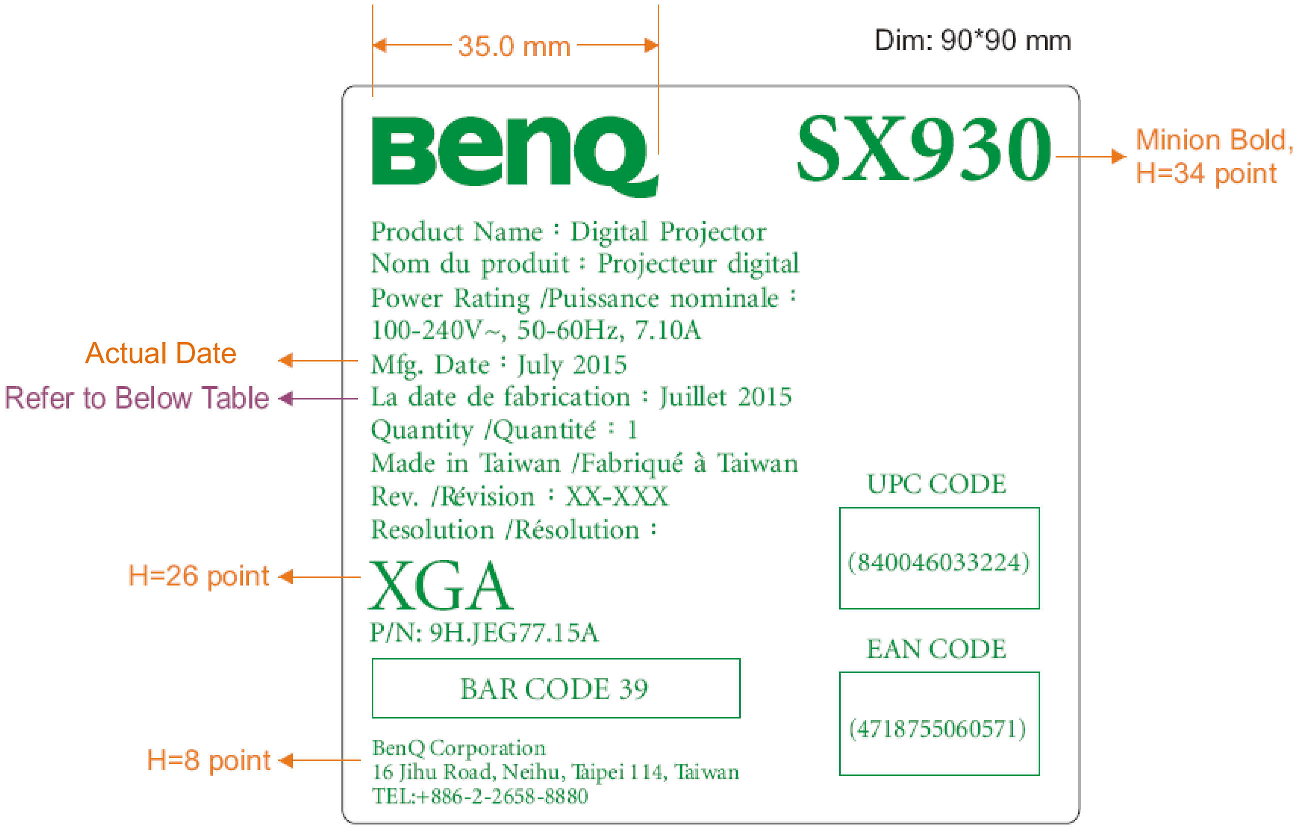
【NOTE】The updated Service BOM is on SPO system. Please check it to order service parts.

1. For 9H.JEG77.15X:



CTN LBL PRINTING:

1. For 9H.JEG77.15A



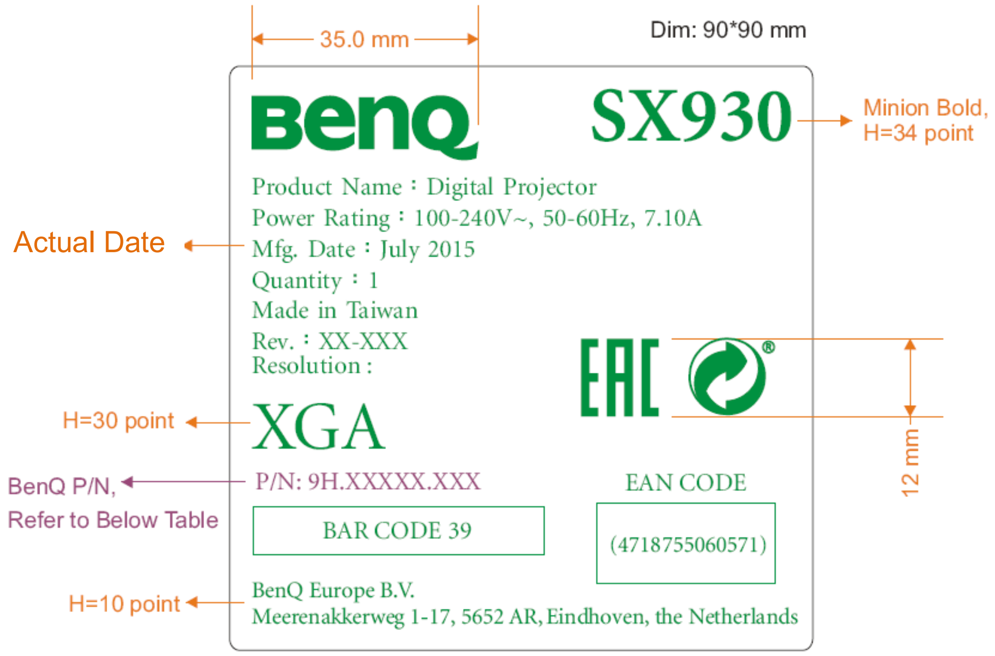
*** Besides Mark, English Font - Minion, H=10 point

*** Scale 1:1

English	French
January	Janvier
February	Février
March	Mars
April	Avril
May	Mai
June	Juin

English	French
July	Juillet
August	Août
September	Septembre
October	Octobre
November	Novembre
December	Décembre

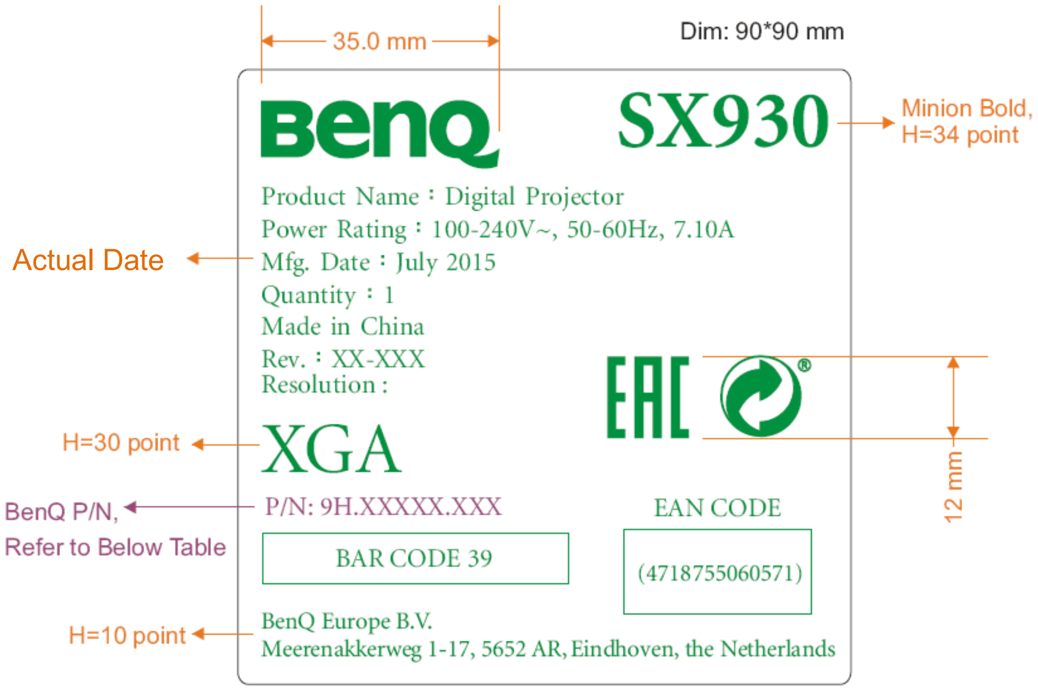
3. For 9H.JEG77.15E/15U



*** Besides Mark, English Font - Minion, H=11 point

*** Scale 1:1

Qisda P/N	BenQ P/N
9J.2UW77.B9E	9H.JEG77.15E
9J.2UW77.B9U	9H.JEG77.15U



*** Besides Mark, English Font - Minion, H=11 point

*** Scale 1:1

Qisda P/N	BenQ P/N
9J.2UW77.B8E	9H.JEG77.15E

4. For 9H.JEG77.15T



*** Besides Mark, English Font - Minion, TC Font - 文鼎中黑, H=10 point
*** Scale 1:1

SPEC LBL PRINTING:

1. For 9H.JEG77.15X, exclude 9H.JEG77.15C

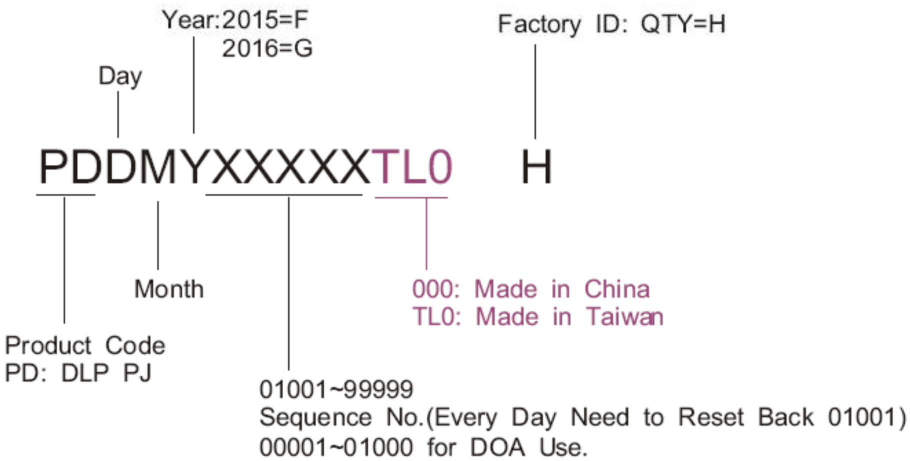
Dim: 95*55 mm



*** Besides Mark, English Font - Gill Sans, TC Font - 文鼎中黑, SC Font, H=6 point

*** P/N / 產品料號：9H.JEG77.15X，最後一碼以 X 表示。

*** Scale 1:1



Day: 1~9, A=10, B=11, C=12, D=13, E=14, F=15, G=16, H=17, J=18, K=19, L=20, M=21, N=22, P=23, R=24, S=25, T=26, V=27, W=28, X=29, Y=30, Z=31(don't use :0,I,O,Q,U)

Month: 1=Jan, 2=Feb, 3=Mar, 4=Apr, 5=May, 6=Jun, 7=Jul, 8=Aug, 9=Sep, A=Oct., B=Nov, C=Dec

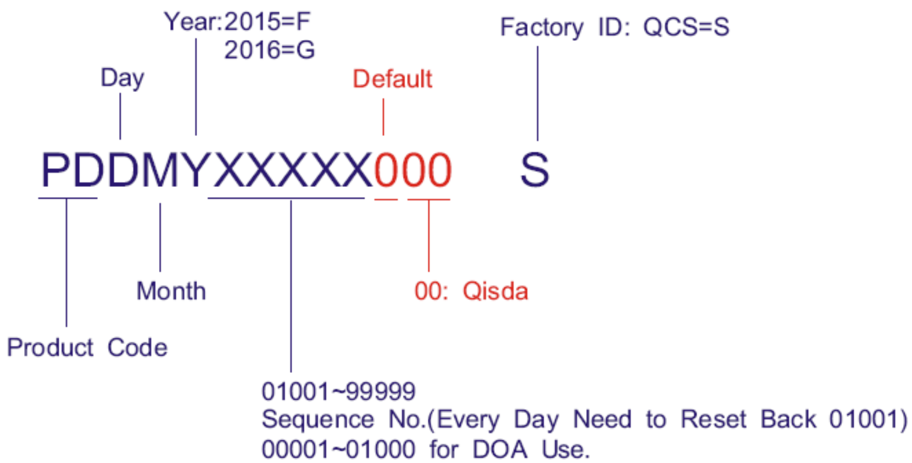
2. For 9H.JEG77.15E

Dim: 95*55 mm



*** Besides Mark, English Font - Gill Sans, TC Font - 文鼎中黑, SC Font, H=6 point

*** Scale 1:1

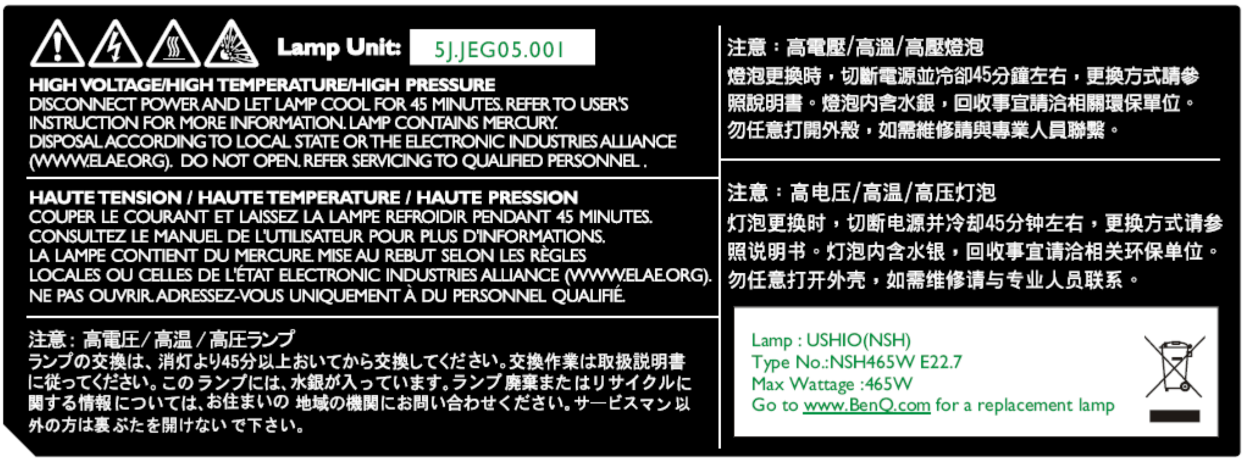


Day: 1~9, A=10, B=11, C=12, D=13, E=14, F=15, G=16, H=17, J=18, K=19, L=20, M=21, N=22, P=23, R=24, S=25, T=26, V=27, W=28, X=29, Y=30, Z=31(don't use :0,I,O,Q,U)

Month: 1=Jan, 2=Feb, 3=Mar, 4=Apr, 5=May, 6=Jun, 7=Jul, 8=Aug, 9=Sep, A=Oct., B=Nov, C=Dec

LAMP LBL PRINTING

Dim: 115*42 mm



*** English Font - Gill Sans, H = 5 point

*** Scale 1:1

3.3 Customer Acceptance

1.0 SCOPE

This document establishes the general workmanship standards and functional acceptance criteria for projector produced by BENQ.

2.0 PURPOSE

The purpose of this publication is to define a procedure for inspection of the projector by means of a customer acceptance test, the method of evaluation of defects and rules for specifying acceptance levels.

3.0 APPLICATION

The "Customer Acceptance Criteria" is applicable to the inspection of the projector, completely packed and ready for dispatch to customers. Unless otherwise specified, the customer acceptance inspection should be conducted at manufacturer's site.

4.0 DEFINITION

The "Customer Acceptance Criteria" is the document defining the process of examining, testing or otherwise comparing the product with a given set of specified technical, esthetic and workmanship requirements leading to an evaluation of the "degree of fitness for use", including possible personal injury or property damage for the use of the product.

5.0 CLASSIFICATION OF DEFECTS

The defects are grouped into the following classes:

5.1 Critical defect

A critical defect is a defect which judgment and experience indicate that there is likely to result in hazardous or unsafe conditions for individuals using product.

5.2 Major defect

A major defect is a defect, other than critical one, is likely to result in failure, or to reduce materially the usability of the product for its intended purpose.

5.3 Minor defect

A minor defect is a defect that is not likely to reduce materially the usability of its intended purpose, or is a departure from established standards having little bearing on the effective use of operation of the product.

Note: If BenQ defect undefined failure, and it judged that is reduce the merchandisebility, BenQ CM Inform this defect. After that parties make communication and decide how to solve.

6.0 EXPRESSION OF DEFECTIVES

$$\text{Percent of defects} = \frac{\text{Number of defects}}{\text{Number of products inspected}} \times 100\%$$

7.0 INSPECTION STANDARD

Unless otherwise specified, the inspection standard will be defined by MIL-STD-105E, NORMAL INSPECTION LEVEL Ⅱ, SINGLE SAMPLING PLAN.

7.1 Acceptance Quality Level

7.1.1 Critical Defect:

When a critical defect is found, this must be reported immediately upon detection, the lot or batch shall be rejected and further shipments shall be held up pending instructions from the responsible person in relevant department.

7.1.2 under normal sampling

Critical	Defective : 0% AQL
Major	Defective : 0.65% AQL
Minor	Defective : 2.5% AQL

8.0 GENERAL RULES

8.1 The inspection must be carried out by trained inspectors who have good knowledge about the product.

8.2 The inspection must be based upon the documents concerning the completely assembled and packed product.

8.3 When more defects appear with the same unit only the most serious defect has to be taken into account.

8.4 Defects found in accessory packed with the product such as Cable, Connector, Manual, CD and the like, and being inspected as a part of the complete product, must be included in the evaluation.

8.5 The evaluation must be within the limits of the product specification and, for not specified characteristics, refer to the sample machine or the judgment of BENQ QA Engineer. But any kind of proposals or judgments must be reasonable and acceptable by both sides.

8.6 Faults must be able to be repeatedly demonstrated.

9.0 TEST CONDITIONS

Unless other prescription, the test conditions are as followings:

Nominal voltage: refer to operation manual

Environmental illumination:

Variable from 500 to 800 Lux (For appearance inspection)

Variable from 0 to 7 Lux (For functional inspection)

Temperature: 25±5℃

Visual inspection shall be done with the distance from eyes to the sample 40~50 cm.

Display mode: refer to operation manual

10.0 TEST EQUIPMENTS

Dark room

PC

Pattern Generator: Chroma or equivalent

DVD player

Power supply (100~240 VAC) with consumption meter

Measuring tape

4. Level 1 Cosmetic / Appearance / Alignment Service

4.1 Cosmetic / Appearance Inspection Criteria

TABLE 1. General Product of plastic outlook of dot, blemish, and others spec inspection standard (产品一般外观塑料件的黑点、杂质、凸点、砂粒缺陷检验标准)

	规格 Spec (面积 cm^2) (Area cm^2)	A 级面 A surface (允许数) (Number of defect)				B 级面 B surface (允许数) (Number of defect)				C 级面 C surface (允许数) (Number of defect)			
		20*20	50*50	70*70	100*100	20*20	50*50	70*70	100*100	20*20	50*50	70*70	100*100
杂质 Particle 黑点 Blemish | 异色点	P < 0.1 mm^2 点距 Distance ≥ 2cm	不计 Ignore	不计 Ignore	不计 Ignore	不计 Ignore	不计 Ignore	不计 Ignore	不计 Ignore	不计 Ignore	不计 Ignore	不计 Ignore	不计 Ignore	不计 Ignore
	0.1≦P< 0.2 mm^2 点距 Distance ≥ 4cm	2	3	4	5	2	3	4	5	4	4	5	6
	0.2≦P <0.3mm^2 点距 Distance ≥ 4cm	0	0	0	0	2	3	4	5	3	4	5	6
凸点 砂粒 棉絮 毛屑 Particle | 同色点 Spot with same color	P<0.1 mm^2 点距 Distance ≥ 2cm	不计 Ignore	不计 Ignore	不计 Ignore	不计 Ignore	不计 Ignore	不计 Ignore	不计 Ignore	不计 Ignore	不计 Ignore	不计 Ignore	不计 Ignore	不计 Ignore
	0.1 ≦ P<0.2mm^2 点距 Distance ≥ 4cm	4	4	5	6	5	5	6	7	6	6	7	8
	0.2≦P < 0.3mm^2 点距 Distance ≥ 4cm	3	4	4	5	4	5	5	6	6	7	7	8
	0.3≦P < 0.5mm^2 点距 Distance ≥ 5cm	2	2	3	4	3	3	4	5	4	4	5	6
	Total	4	4	5	6	5	5	6	7	6	6	7	8

备注 Note:

1. 检测面积 A <20*20 以 20*20 之规范检验之, 20*20≦A<50*50，以 50*50 等级检验之，以此类推.
   Use the 20*20 criteria to the area less than 20*20; 50*50 inspection criteria to the area 20*20≦A<50*50; etc.
   杂质/黑点/异色点(Particle/Blemish/Color Spot)
   1.1 A、B、C 级面定义请参考 6.2 级面定义。
   Definition of surface A, B, C refer to 6.2
   1.2 LOGO 周边 2 cm 内不可有 0.05 mm^2 以上之点, (0.05 mm^2 以内之点不计)。
   Blemish around the logo must be equal or smaller than 0.05 mm^2
   1.3 表面气泡—不可有。
   Bubble on the surface is to be reject.

TABLE 2 :(General Product of plastic outlook inspection standard)

NO	Appearance	Spec
1	缩水 Shrinkage	A 区：不可有缩水，以带手套检验，手摸过去不可有凹陷的感觉 A region: No Shrink. With gloves, no feeling of sink when touching the surface B / C 区：不能明显看出 B/C region: not obvious
2	流痕，咬花， 光泽 Run, Texture, Gloss	不能有明显的深浅不均 No obvious non-uniformity
3	接合线 Welding Line/Knit Line	用指甲划过不会有停顿感,并附近无明显之光泽差异 When scratching on it, there's no feeling of obstruction. Also, there should not be obvious difference in gloss nearby it.
4	顶白 Ejector Mark	不可 Reject
5	Label/screws shortage	不允许 Reject
6	缺料 Material shortage	缺料不可影响机构强度和表面 Material shortage is not allowed to impact structure strength and surface
7	色差 Chromatic aberration	喷漆(Painting): ΔE<=2; L<=1.5 ; Δ A,B <= 0.6 银粉漆 (Paint, aluminum). ΔE<=2 L<=1.0; Δ A, B <= 0.6 非银粉漆(Paint, non-aluminum) 素材(Raw material) : ΔL,A,B<=0.6 ,ΔE<=0.75
8	印刷 Printing	文字印刷不得有漏印、断线、重影、组细不均、溢墨、印偏(1mm)、印斜 (歪斜＜0.3 mm)。 Printing must not have incomplete printing, break off, overlap, uneven thickness, excessive ink, printing misalignment (1mm), printing slanting & crooked (<0.3mm) 文字印刷颜色须确认是否正确 。 Printing color must be comparable to color chip and sample.
9	Logo of panel sticker	文字印刷不得有漏印.断线.重影.组细不均.溢墨.印偏(1mm)印斜(歪斜 ＜ 0.5 mm). Printing must not have incomplete printing, break off, overlap, uneven thickness, excessive ink, printing misalignment (1mm), printing slanting & crooked (<0.5mm) 文字印刷颜色须确认是否正确. Printing color must be comparable to color chip and sample.
10	刮伤 Scratch/Nicks	Side A: (W < 0.1mm , L < 3mm): 容许 1 个 Only 1 this kind of scratch is accepted W < 0.1mm , L < 3-5mm 容许 0 个 No this kind of scratch is accepted Side B: W < 0.15mm , L < 3mm 容许 2 个 Only less than 2 this kind of scratch is accepted W < 0.15mm , L < 3-5mm 容许 1 个 Only 1 this kind of scratch is accepted

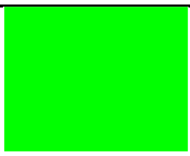
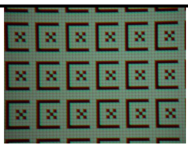
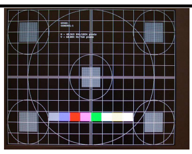
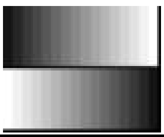
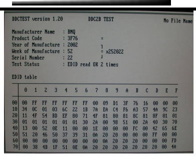
		<u>Side C:</u> W < 0.2mm , L < 1mm　容许 4 个 Only 4 this kind of scratch is accepted W < 0.2mm , L < 3mm　容许 3 个 Only 3 this kind of scratch is accepted W < 0.2mm , L < 3-5mm 容许 2 个 Only 2 this kind of scratch is accepted Note: 刮伤见底材者不允许 Severe scratch which disclose the Natural 1. 刮擦伤两两需相距 5cm 以上 Each scratch should be 5cm more far away from each other

TABLE 3 产品镁铝合金制品之黑点、杂质、凸点、砂粒缺陷检验标准检验规范
(Magnesium-Aluminum Alloy Products that Dot, Blemish, and Others spec.)

	规格 Spec (面积 cm^2) (Area cm^2)	A 级面 A surface (允许数) (Number of defect)				B 级面 B surface (允许数) (Number of defect)				C 级面 C surface (允许数) (Number of defect)			
		20*20	50*50	70*70	100*100	20*20	50*50	70*70	100*100	20*20	50*50	70*70	100*100
杂质 Particle 黑点 Blemish | 异色点 Color spot	P < 0.1 mm^2	不计 Ignore	不计 Ignore	不计 Ignore	不计 Ignore	不计 Ignore	不计 Ignore	不计 Ignore	不计 Ignore	不计 Ignore	不计 Ignore	不计 Ignore	不计 Ignore
	0.1≦P< 0.3 mm^2 点距 ≥7.5cm Distance	1	2	3	4	2	3	3	5	3	4	5	6
	0.3≦P <0.5mm^2 点距 ≥ 7.5cm Distance	0	0	0	0	2	2	3	4	2	3	4	5
	0.5≦P <0.7mm^2 点距 ≥ 7.5cm Distance	0	0	0	0	0	0	1	2	1	2	3	4
凸点 砂粒 棉絮 毛屑 Particle | 同色点 Spot with same color	P<0.1 mm^2 点距 ≥ 7.5cm Distance	不计 Ignore	不计 Ignore	不计 Ignore	不计 Ignore	不计 Ignore	不计 Ignore	不计 Ignore	不计 Ignore	不计 Ignore	不计 Ignore	不计 Ignore	不计 Ignore
	0.1≦P<0.3mm^2 点距 ≥ 7.5cm Distance	2	2	3	4	3	4	5	6	4	5	6	7
	0.3≦P < 0.5mm^2 点距 ≥ 7.5cm Distance	1	1	2	3	2	2	3	4	2	3	3	4
	0.5≦P < 0.7mm^2 点距 ≥ 7.5cm Distance	0	0	1	2	1	1	2	3	1	2	2	3
	Total	3	3	4	5	5	6	7	8	6	7	8	9

4.2 OPERATIONAL INSPECTION CRITERIA

1. TEST PATTERN

PATTERN	PATTERN	TEST ITEM
Full white		ANSI Brightness、Bright Uniformity、FOFO Contrast Ratio、CIE white coordinate、Throw Ratio、Zoom Ratio、Distortion
Full Dark		FOFO Contrast Ratio
Full Red		Impurity、CIE coordinate
Full Green		Impurity、CIE coordinate
Full Blue		Impurity、CIE coordinate
Chromo 1280 x 1024		Focus Range
General-1 pattern		Performance/ Timing check/ function check
32 Gray		Gray Check
DDC check		Check the DDC information, Including S/N, model, manufacturer name, product code.

2.TEST CONTENT:

	Test Condition	TEST ITEM	Input	Equipment
PC Mode	Chroma pattern 1280 x 1024	Focus/ Focus range	D-SUB	Chroma
	FULL W , R , G , B	Impurity, CIE coordinate, pixel fail		
DVD picture	NTSC disk/ PAL disk	Picture quality	Video S-video Ypbpr HDMI	DVD player

3. SPECIFICATION:

Item	Spec.	Condition	Pattern
ANSI Brightness	Normal: Minimum 6300 lm (environment>35℃, MKT>6000 lm)	Contrast: Preset Brightness: Preset	Full white
ANSI (-) uniformity	Minimum -50%	Contrast: Preset Brightness: Preset	Full white
ANSI Contrast	Minimum 150:1	Contrast: Preset Brightness: Preset	Chessboard
FOFO Contrast Ratio	Minimum 1500:1 (WCE2)	Contrast: Preset Brightness: Preset	Full white and Full dark
Light Leakage out of Active Area(except DMD defect)	≦1 lux, @ full black pattern with 60"~80" ≦3 lux, @ out of full black pattern with diagonal 80~120" ≦20 lux, @ out of full black pattern with diagonal >120"	Contrast: Preset Brightness: Preset	Full black pattern
CIE white coordinate	x=0.319±0.02 y=0.353±0.02	Contrast: Preset Brightness: Preset	Full white
CIE red coordinate	x=0.637±0.04 y=0.357±0.04	Contrast: Preset Brightness: Preset	Full Red
CIE green coordinate	x=0.339±0.04 y=0.570±0.04	Contrast: Preset Brightness: Preset	Full Green
CIE blue coordinate	x=0.147±0.03 y=0.068±0.03	Contrast: Preset Brightness: Preset	Full Blue
Throw Ratio	Wide 78" ±3% @ 2.38m	Contrast: Preset Brightness: Preset	Full white
Keystone Distortion	<1.0%	Contrast: Preset Brightness: Preset	Full white
Vertical TV Distortion	<1.0%	Contrast: Preset Brightness: Preset	Full white
Focus Range	W: 1.86 ~ 9.32m T: 2.98 ~ 14.91 m	Contrast: Preset Brightness: Preset	Chroma 84 X pattern
Gray Check	Should be clear and bright	Brightness: Preset Contrast: Preset	Chroma 32 gray pattern
DMD Image Quality	See Defect Classification	See Defect Classification	See Defect Classification
PC	PC Compatible 640X480 → 1920X1080(16 :9), Composite-Sync	Contrast: Preset Brightness: Preset	Chroma Test pattern

Video	NTSC/ PAL/ SECAM	Contrast: Preset Brightness: Preset	VG828 Test pattern
YPbPr	NTSC (480i)/ 480p/ PAL (576i)/ 576p, HDTV (720p/ 1080)	Contrast: Preset Brightness: Preset	VG828 Test pattern
S-Video	NTSC/ PAL/ SECAM	Contrast: Preset Brightness: Preset	VG828 Test pattern
HDMI	NTSC (480i)/ 480p/ PAL (576i)/ 576p, HDTV (720p/ 1080); PC Compatible 640X480 → 1920X1080(16 :9), Composite-Sync	Contrast: Preset Brightness: Preset	VG828 Test pattern

4. Power Consumption:

Power consumption	Max.	645W
	Standby	0.5W Max. at 100 ~ 240VAC (disable loop through, Lan function)
		3W MAX at 230VAC 50HZ for network mode
	Normal	Typical 610W @110Vac
	ECO	Typical 564W@110Vac
	ECO Blank	Same as Eco Mode

5. OPERATIONAL INSPECTION CRITERIA:

No	Description	Class
1	**Noise**	
1.1	When power on or power off, fan or color wheel get abnormal noise.	Major
1.2	When normal operation, noise exceed noise level (refer to Q201 document)	Major
2	**Display Quality** (include input:Video, S-video,YPbPr, HDMI, and D-sub or RGB)	
2.1	Focus range out of specification	Major
2.2	Focus fail (focus not clear or flare/ defocus/ lateral color out of specification)	Major
2.3	Brightness & Uniformity --- out of specification.	Major
2.4	Contrast ratio --- out of specification	Major
2.5	Color coordinates --- out of specification.	Major
2.6	Light leakage out of specification (active area or out of active area)	Major
2.7	Throw ratio out of specification	Major
2.8	Room ratio out of specification	Major
2.9	Picture distortion out of specification	Major
2.10	DMD image out of specification	Major
2.11	Picture dust or other image quality out of specification	Major
2.12	Gray stage check --- Missing stage	Major
2.13	Video noise --- If video noise presented	Major
2.14	DDC data error / incorrect	Major
2.15	Mode detection error	Major
2.16	OSD Malfunction	Major
3	**Audio Quality**	
3.1	Audio malfunction	Major
3.2	Speaker no function	Major
3.4	Volume mute malfunction	Major
4	**Remote control malfunction**	Major

6. IMAGE QUALITY SPECIFICATION:

1. Scope

This document specifies the image quality requirements applicable to the DLP®.7XGA Type A and Series 450 Value Component Set. The Component Set provides the DLP®. 7XGA Type A and Series 450 Value Projector with digital imaging functionality based on Digital Micromirror Device (DMD) technology.

2. Definitions: (Defects and Test Screens)

Blemish

A blemish is an obstruction, reflection, or refraction of light that is visible, but out of focus in the projected image under specified conditions of inspection (see Table 1). It is caused by a particle, scratch, or other artifact located in the image illumination path.

Dark pixel

A single pixel or mirror that is stuck in the OFF position and visibly darker than the surrounding pixels.

Bright pixel

A single pixel or mirror that is stuck in the ON position and visibly brighter than the surrounding pixels.

Unstable pixel

A single pixel or mirror that does not operate in sequence with parameters loaded into memory. The unstable pixel appears to be flickering asynchronously with the image.

Adjacent pixel

Two or more stuck pixels sharing a common border or common point, also referred to as a cluster.

Row or Column Defect

The reset boundary artifact is a single row of pixels on the reset group boundaries that are visibly darker or lighter than the neighboring rows of pixels.

Pond of Mirrors (POM)

POM is a rectangular array of off-state mirrors surrounding the active area.

Eyecatcher

Eyecatcher's are blemishes appearing in the area outside of the Active Area. These are due to particles and various DMD window or window aperture "defects" including: digs, voids, and scratches.

Border Artifacts

Border artifacts are a general category of image artifacts that may show up on screen in the area outside of the active array. Border artifacts include: Exposed Bond Wires, Exposed Metal 2, and Reflective Edge.

Bond Wires

Bond Wires are the electrical connections between the die and the DMD ceramic package. If visible, they will appear as short light parallel lines outside of the Pond of Mirrors (POM).

Exposed Metal 2

Exposed Metal 2 is due to a shift in positioning of either the die or the window aperture, which may allow light to be reflected off of the layer of metal 2 that is below the super structure (mirrors). This defect is located outside of the POM.

Reflective Edge

Reflective Edge is light that may reflect from the edge of the DMD window aperture onto the projection screen. It will appear as a thin diffuse line outside of the POM.

Blue 60 Screen

The Blue 60 screen is used to test for major dark blemishes. All areas of the screen are colored a Microsoft Paintbrush blue 60 (green and red set at 0, blue set at 60). NOTE: If linear degamma is not used then the Microsoft Paintbrush values must be adjusted to match the degamma table being used in order to generate an equivalent blue level on the test screen image.

Gray 10 Screen

The Gray 10 screen is used to test for major light blemishes. All areas of the screen are colored a Microsoft Paintbrush gray 10 (green, red, and blue set at 10).
NOTE: If linear degamma is not used then the Microsoft Paintbrush values must be adjusted to match the degamma table being used in order to generate an equivalent gray level on the test screen image.

Gray 30 Screen

The Gray 30 screen is used to test for the reset boundary artifact. All areas of the screen are colored a Microsoft Paintbrush gray 30 (green, red, and blue set at 30).
NOTE: If linear degamma is not used then the Microsoft Paintbrush values must be adjusted to match the degamma table being used in order to generate an equivalent gray level on the test screen image.

3. ACCEPTANCE REQUIREMENTS

3.1 Conditions of Acceptance

All DMD image quality returns will be evaluated using the following projected image test conditions:
Test Set degamma shall be linear.
Test Set brightness and contrast settings shall be set to nominal.
The diagonal size of the projected image shall be a minimum of 60 inches.
The projection screen shall be 1X gain.
The projected image shall be inspected from an 8 feet minimum viewing distance.
The image shall be in focus during all Table 1 tests.

3.2 Test Sequence

Tests shall be run in the sequence listed in Table 1.

Table 1. Image Quality Specification

SEQ#	Test	SCREEN	ACCEPTANCE CRITERIA
1	Major Dark Blemish	Blue 60	1. ≦4 visible dark blemishes are allowed in the active area 2. No blemish will be ＞1.5" long/diameter
2	Major Light Blemish	Gray 10	1. ≦4 visible dark blemishes are allowed in the active area 2. No blemish will be ＞1.5" long/diameter
3	Reset Boundary Artifact	Gray 30	No reset boundary artifacts allowed
4	Eyecatchers / Border Artifacts	Any screen	Eyecatcher and border artifacts are allowed
5	Projected Images	1. Any screen 2. Gray 10 3. Any screen 4. Gray 10 5. Whit 6. Any screen 7. Any screen	1. No adjacent pixels 2. No bright pixels in Active Area 3. No unstable Pixels in Active Area 4. ≦ 1 right pixel in the POM 5. ≦ 4 dark pixels in the Active Area 6. No DMD window aperture shadowing on the Active Area 7. Minor blemishes are allowed

Notes:

1. Projected blemish numbers include the count for the shadow of the window artifact in addition to the artifact itself.
2. During all Table 1 tests, projected images shall be inspected in accordance with the conditions of inspection specified in Section 3.
3. The rejection basis for all cosmetic DMD defects (scratches, nicks, particles) will be the projected image tests referenced in Table 1.
4. Devices that meet this image quality specification but are deemed undesirable by the customer

may not be returned to TI without prior approval by TI.

5. Screens < Gray 10 shall not be used as a basis for rejecting a DMD for image quality.

4.3 Software/Firmware Upgrade Process

A. Basic Operating

(a) Standby Mode：

User can just plug in power cord, then projector will enter standby mode. Power LED will show Red for around 1 sec, then show Orange continuously as the figure shown below. When the power LED shows Red, it means system is not ready for standby. In another word, if the power LED shows Orange, it means system is in standby mode and the DLP system has no power support, except MCU and its related circuits.

When standby mode, system power consumption will be less than 0.5 Watt.

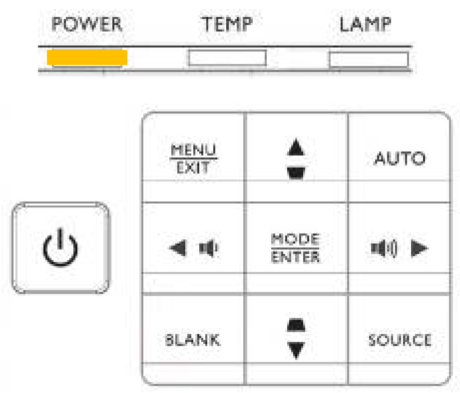
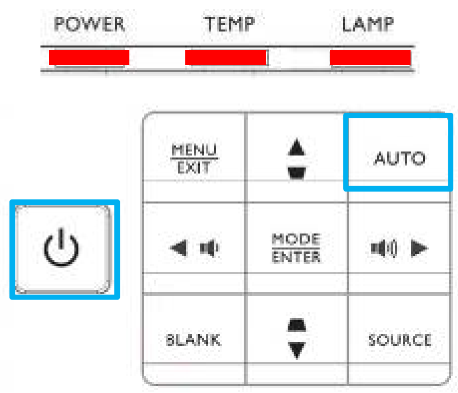
User can turn on projector after plugging in power cord whatever the power led is red or orange.

(b) Download Mode：

This mode is applied for firmware download.

If operator wants to enter this mode, he should press and hold both keypad-**POWER** and Keypad-**AUTO** at the same time, then plug in power cord. **After plugging power cord,** still hold POWER +AUTO at least 5 seconds, and make sure **Power/TEMP/LAMP** LED shows flash Red continuously as the figure below shown, then release the two keypads(Notice). In download mode, system will be supported by full power but will not turn on projector. Operator can use DLP composer to download new firmware.

(**Notice:** After entering Download Mode, pressing Power key will not turn on the projector. So you could press Power key after entering Download Mode operation, to check if it really enters Download Mode.)

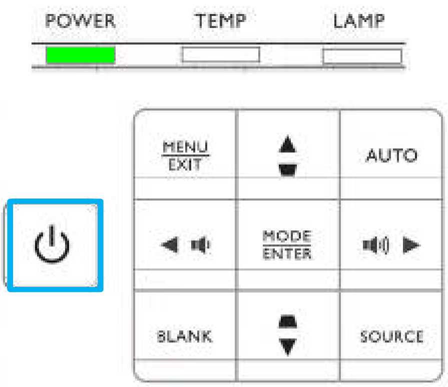
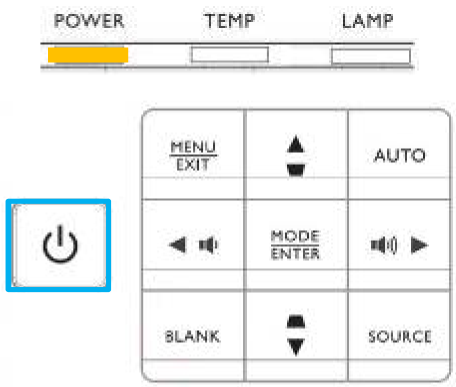
Standby Mode	**Download Mode**
	

(c) Power On：

User can press Keypad Power to turn on projector. User can also use IR remote controller and RS-232 Command：<CR>*pow=on#<CR> to do this action. When system turning on, power LED will flash Green as the figure shown below.

(d) Power Off：

If user wants to turn off projector, user can double click keypad Power, use IR remote controller, or RS-232 Command：<CR>*pow=off#<CR>. Then, system will cool itself via fans for 3 seconds (quick cooling) or 90 seconds (normal). During cooling, Power LED will flash Orange. After cooling, system will return to standby mode and Power LED will become Orange as the figure shown below.

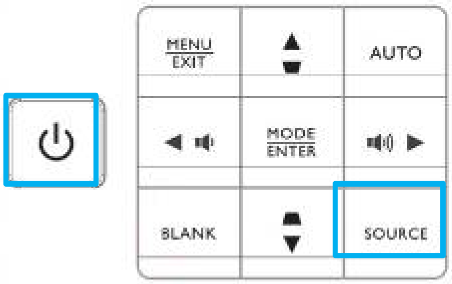
Power On	Power Off
	

(e) EDID Download mode：

To relief PC/ HDMI EDID write protect function:

1. Press **Power+Source** on keypad then plug in power cord.
2. EDID can be downloaded to EEPROM by Q-EDID tools.

EDID Download mode



B. Download MCU, Scalar Firmware, LAN Firmware

(a) Auto MCU Code Download：(for Low-Power Standby)

Condition：

Auto Detect, download by MCU itself.

Situation 1 ：MCU code is empty (The 1st time to plug in power cord)

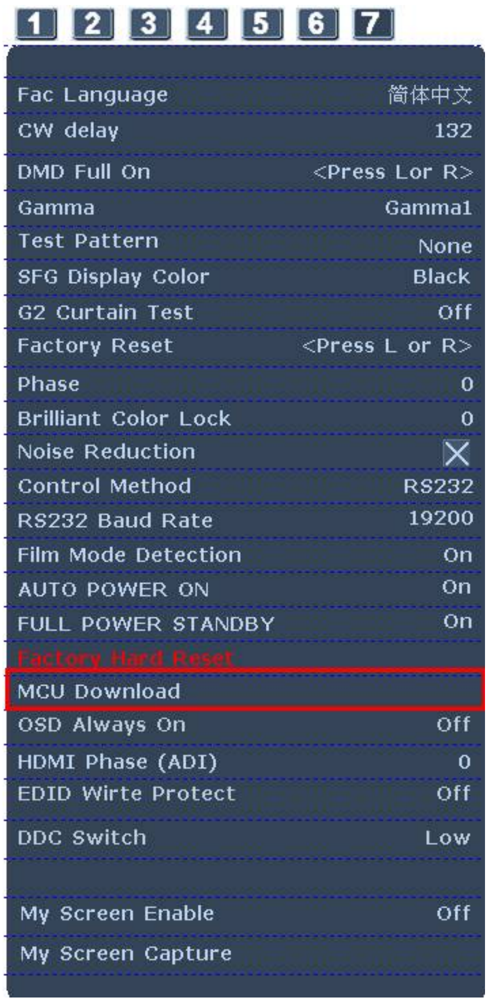
Situation 2 ：MCU version update

Procedure：

Step1: Go to Factory page1(as right figure).

Step2: Select “MCU Download”.

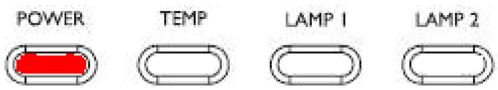
Step3: Repower on the projector.



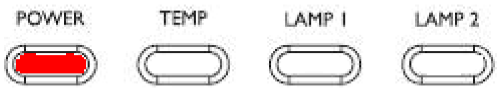
System Action：

System needs around 2 sec to download MCU itself automatically.

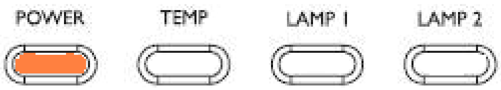
Downloading：Power LED will show Red.



Download Fail：Power LED will show Red.



Download Success：System will go back standby mode and Power LED will show Orange.



Notice：

Do NOT interrupt power when downloading.

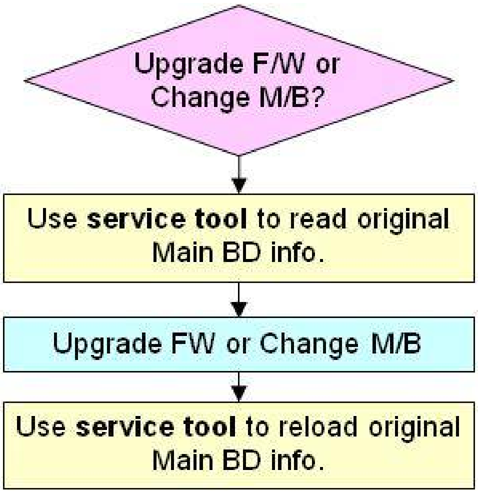
(b) Service Tool –Read and Write data in Main Board

- **Notice:**

  Need to use service tool to read data from Main board before FW re-download or changing Main Board.

  After FW downloaded, need to write data form service tool into Main Board.

- **Flow:**



- **Tool:**
  - Install Service Tool
  - PC
  - RS232 CABLE

- **Procedure:**

I. Installation:

1. Click "setup.exe" file.



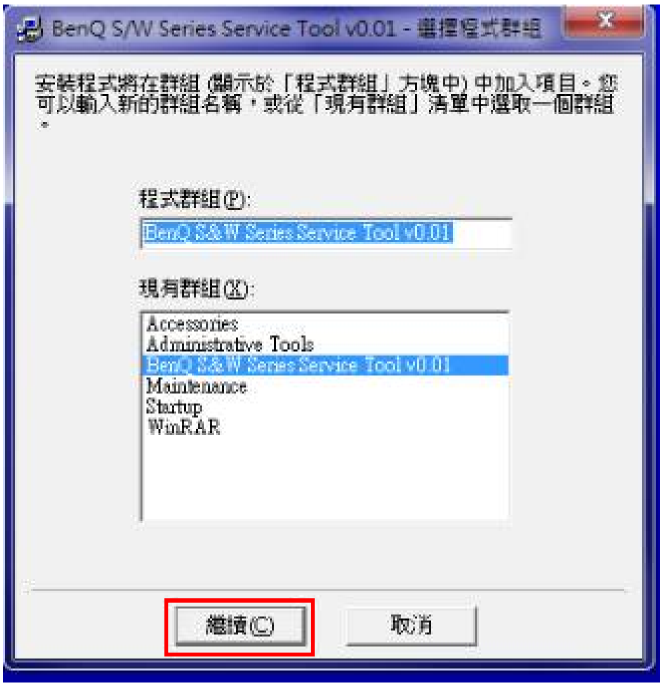
2. Click "OK."



3. Change an installation dictionary or agree default dictionary and then click the icon button.



4. Enter a new group name or select one from the "Existing Groups" list and then click "Continue."



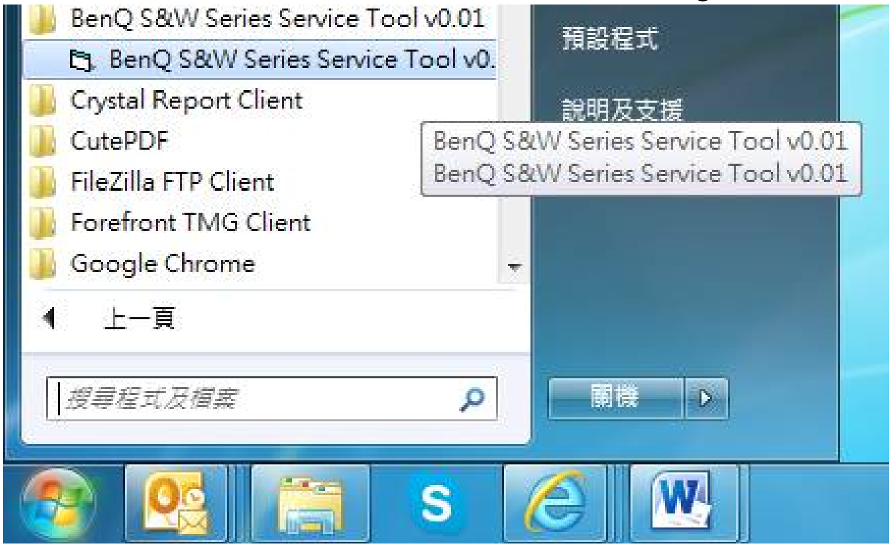
5. Click "OK" and a successful installation is completed.



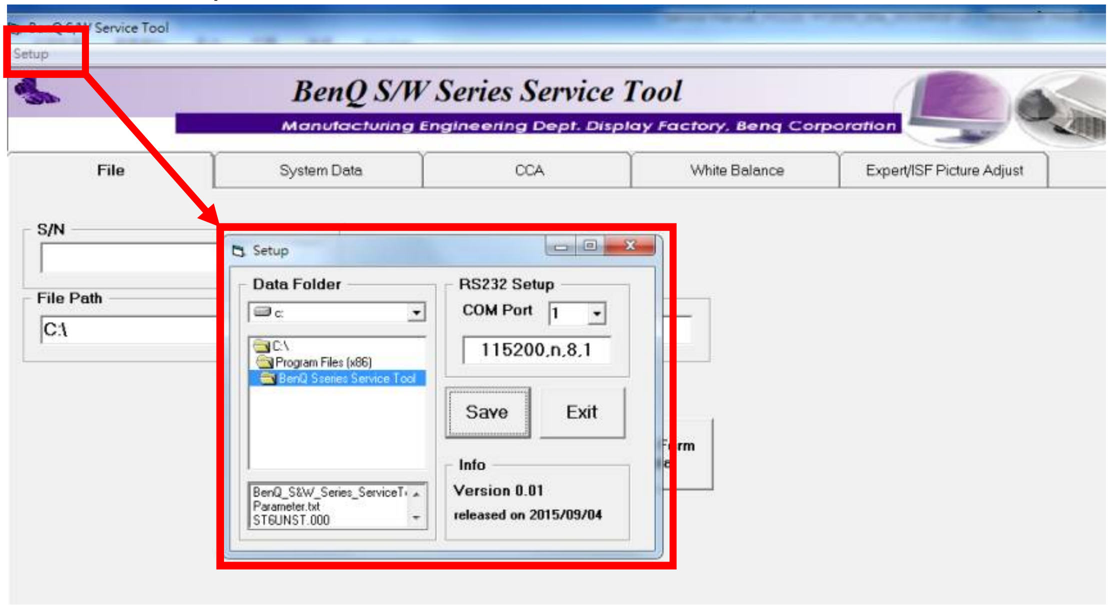
II. How to Use Service Tool

(1) Read Data From Main Board:

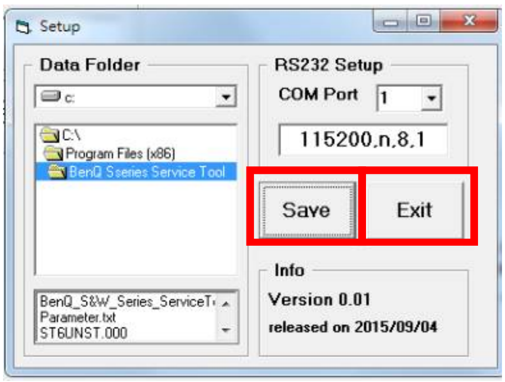
1. Make sure **Factory Menu page1** : Control Method is "RS232".
2. Connect PC with projector by a RS232 cable.
3. Turn on projector.
4. Click "BenQ S&W Series Service Tool" from Program Files menu.



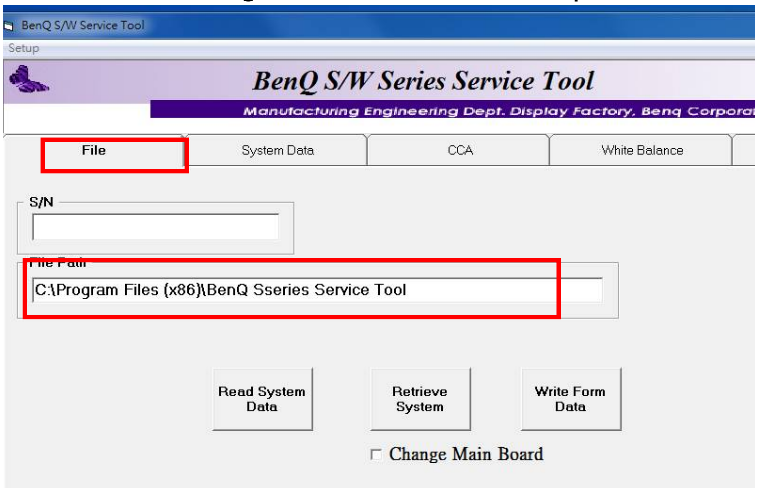
5. Click "Setup" first.



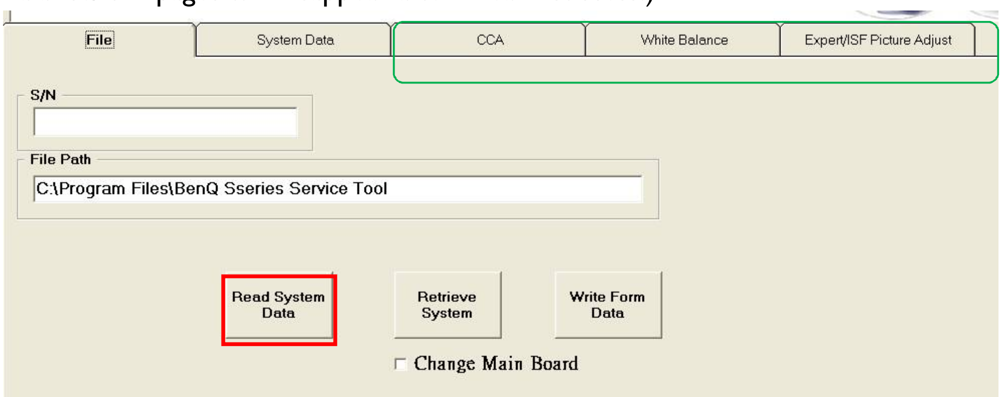
6. Double click to select a folder for saving projector data and a specified COM port and then click "Save" and "Exit."



7. After selecting a data folder, the folder path is showed in “File Path” in “File” page.



8. Click “Read System Data.” (Note)
(**Note:** Since S series (SU922/SW921/SX920/SU931/SX930) don’t support ISF function, the “CCA/White Balance/ISF” pages will disappear after “Read” success.)



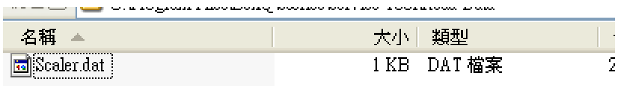
9. ADC calibration data are uploaded first and color temperature data after.
(**Note**: S series “RGBHV” and “Lamp2” items will be blank.)



10. After all pages data are uploaded, "Read System Data" is completed.



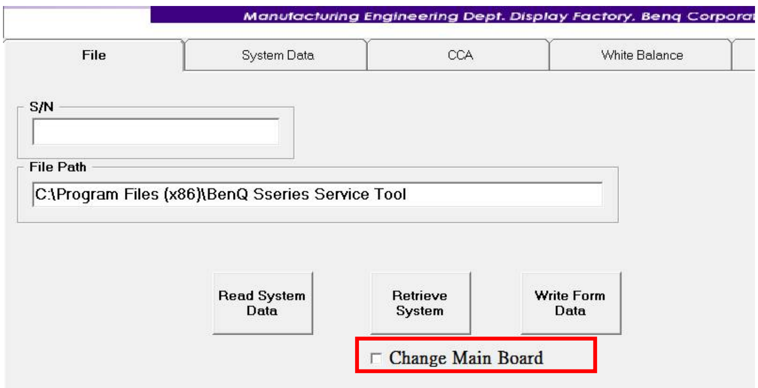
11. After completing "Read System Data," there is a folder named "Read Data" added in the selected folder before.
12. A file named "Scaler.dat" including adjustment data of projector is added in the "Read Data" folder.



13. Turn off projector and the service tool, and then download a new firmware.

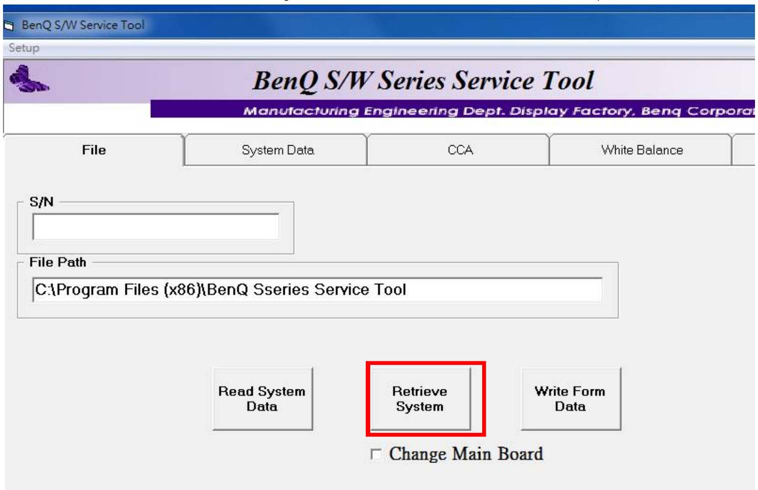
(2) Write Data From Main Board to Projector:

14. After completing firmware download, open the service tool, and connect PC and Projector by RS232 cable.
15. **[Case1]** : If **Main Board is changed to new one**, tick the "**Change Main Board**" item.(Note)
    [Case2] : If only FW re-download **without changing M/B, No Need to tick the "Change Main Board"** item.

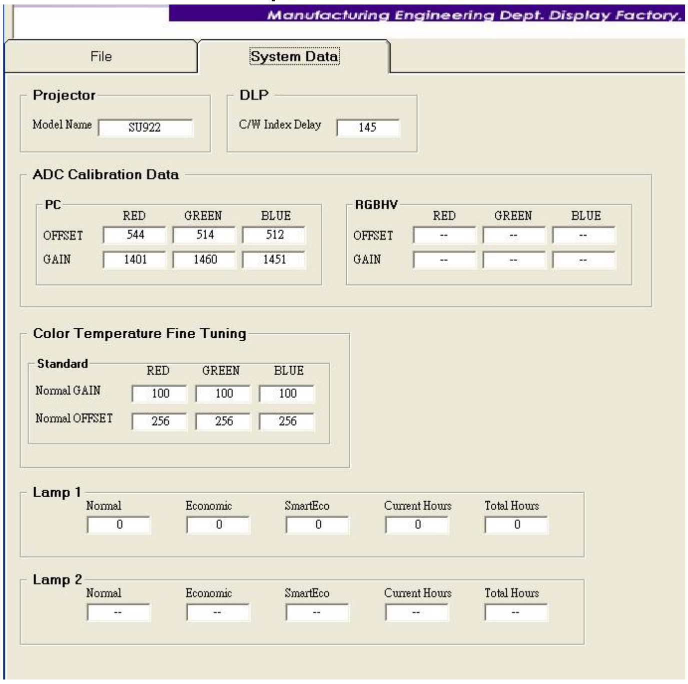


(**Note**: Since M/B service part has initial ADC calibration data from factory, when the "**Change Main Board**" is ticked, the "ADC Calibration Data" will be kept as the initial data in new M/B and will not cover by the data from old M/B.)

16. Click "Retrieve System" to write back adjustment data.



17. CW Index Delay data are written back first and other data after.



18. After data in all pages are written back, "Retrieve System" is completed.



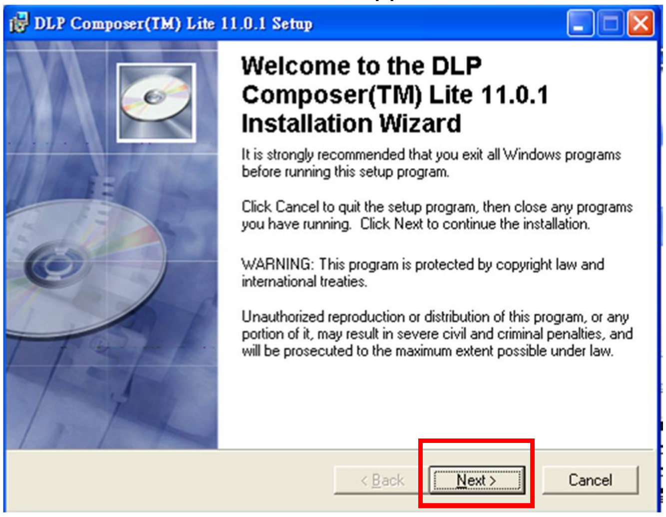
(c) Download Scalar Firmware

i. DLP Composer lite install procedure

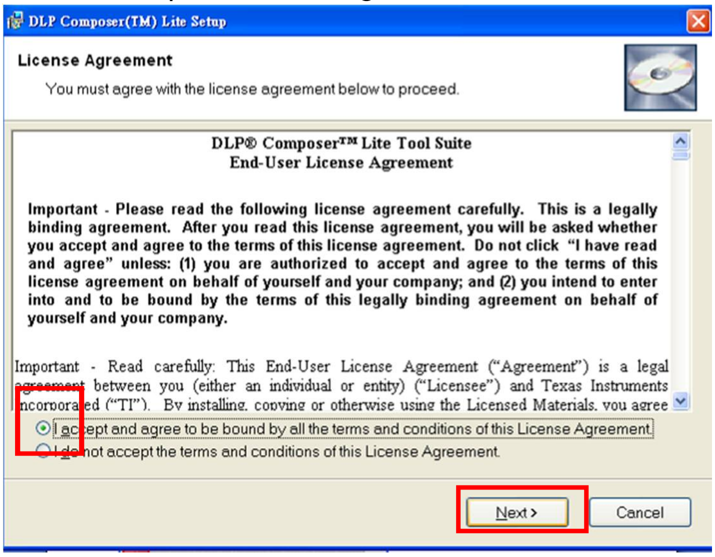
(1) Installation

1. Double click the Setup file for DLP Composer Lite (use 11.0 or above version) to start to install program.

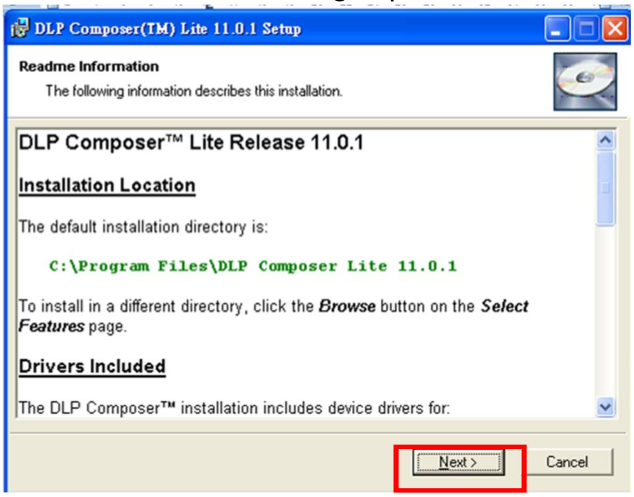
2. When the Installation Wizard appears, click "Next".

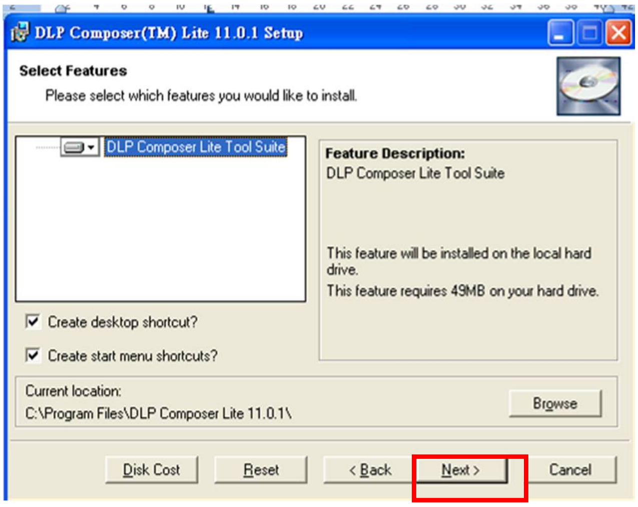


3. Select to accept the License Agreement, then click "Next"

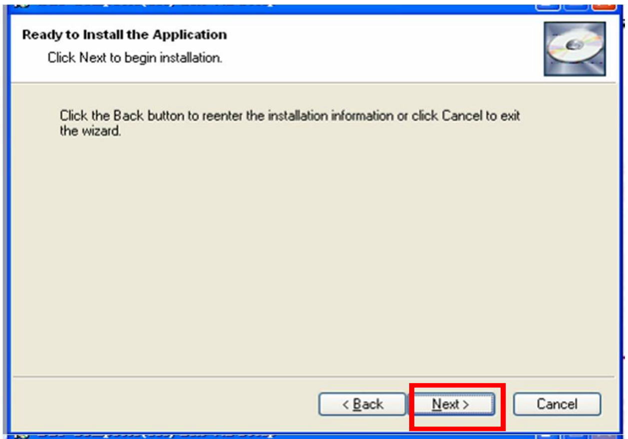


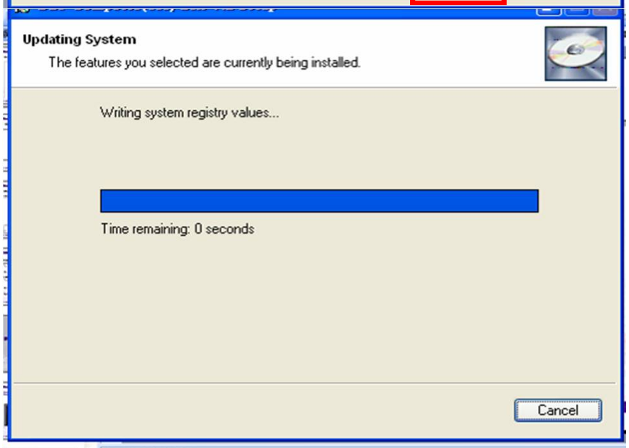
4. Click "Next" in the following steps to continue installation process.



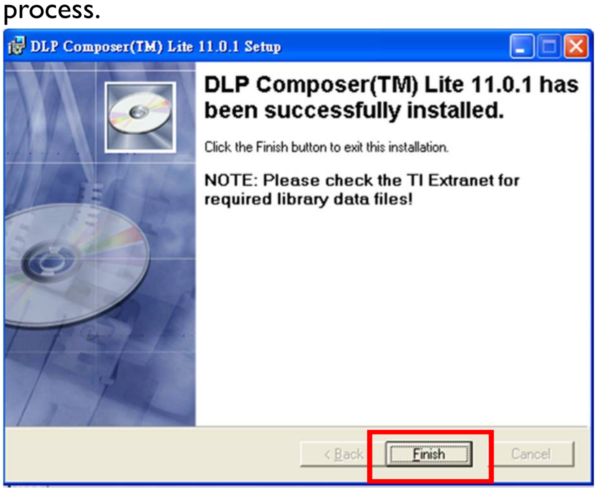


Note:
The default installation directory is:
C:\Program Files\DLP Composer Lite 11.0.1
If you want to install to a different directory (perhaps alongside a prior release of DLP Composer™ Lite), click the "Browse" button on the "Select Features" page.





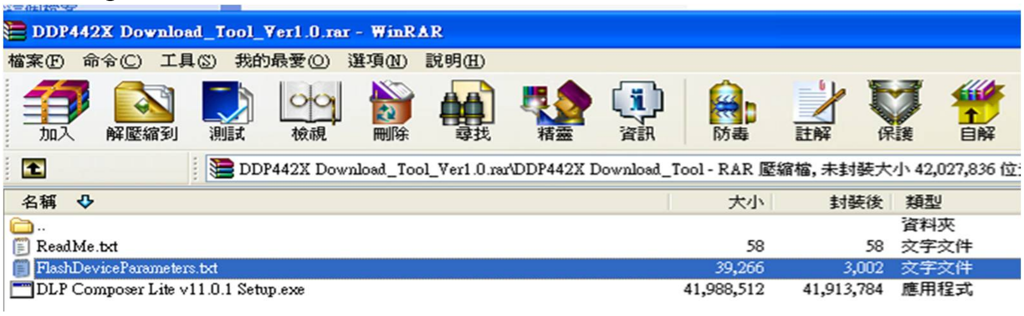
5. When finishing installation, click "Finish", and then restart your computer to complete the installation process.



(2) Setting for your first use

- **Select Library:**

1. Save the "FlashDeviceParameters.txt" into the DLP Composer Lite11.0 installed folder.
You can get the txt file from the installation file "DDP442X Download_Tool_Ver1.0.rar" or later version.

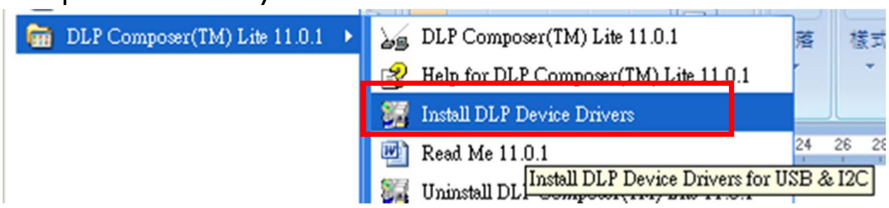




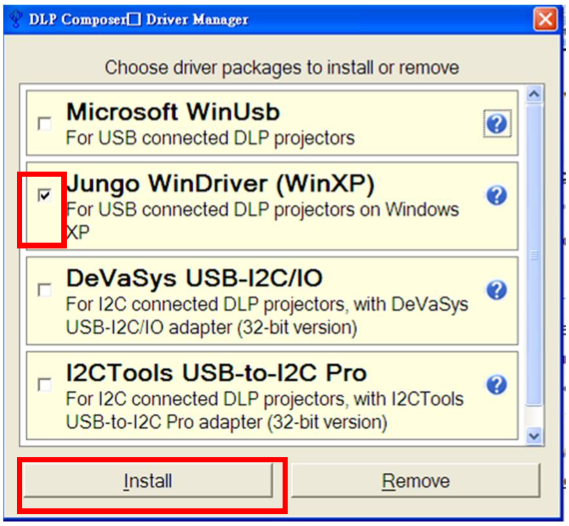
- **USB Driver Installation (Only for download by USB):**

1. After DLP Composer™ Lite 11.0 is installed, it can auto detect your USB driver.

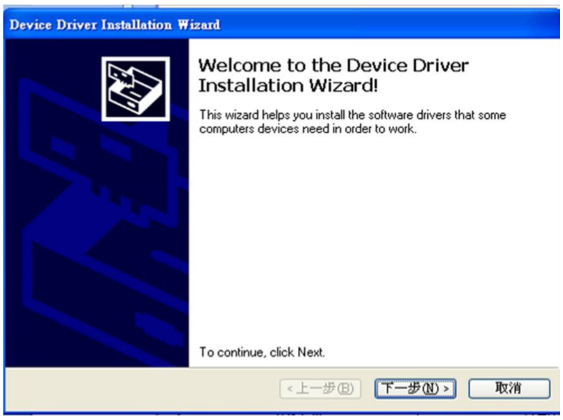
2. If PC still cannot recognize the USB device, choose the "Install DLP Device Drivers" icon under "DLP Composer™ Lite" in your Start menu.

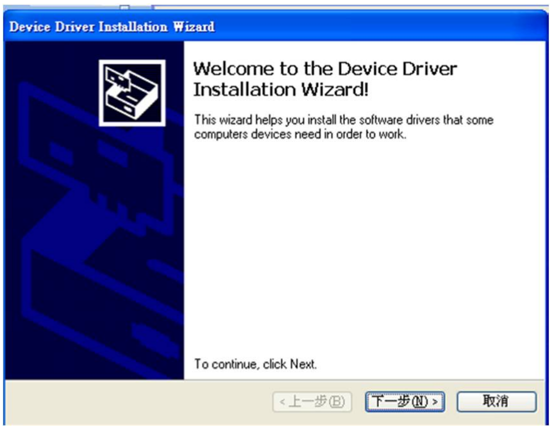


3. Select "Jungo WinDriver" and press "Install".
(**Notice :** "Jungo WinDriver" is available for Windows XP, or Microsoft OS compatible with XP. If this item doesn't appear under other Microsoft OS, ex Windows 7, you can install "Microsoft WinUsb".)



4. Follow the message show in message, and complete the installation when you see the "Completing the Device Driver Installation Wizard" message.



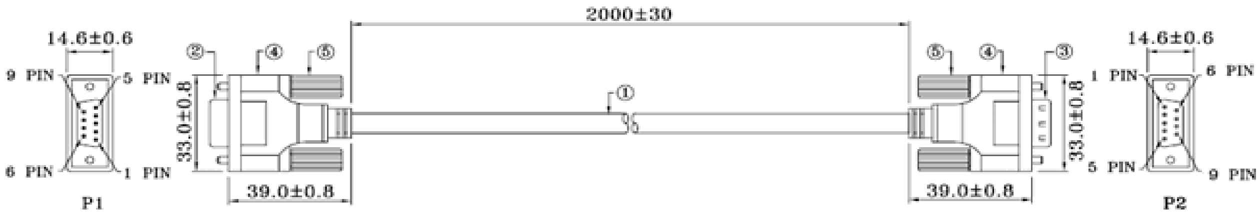


ii. Download Procedure

● How to download (Method-1 : By RS232)

Hardware required

1. Standard RS232 Download cable (SPEC as below)
   D-sub 9-pin Female for Both terminals



WIRE ARRANGEMENT		
P1	COLOR	P2
1	BLACK	1
2	BROWN	3
3	RED	2
4	ORANGE	4
5	YELLOW	5
6	GREEN	6
7	BLUE	8
8	PURPLE	7
9	GRAY	9
CASE	DRAIN WIRE	CASE

2. Personal computer or laptop computer

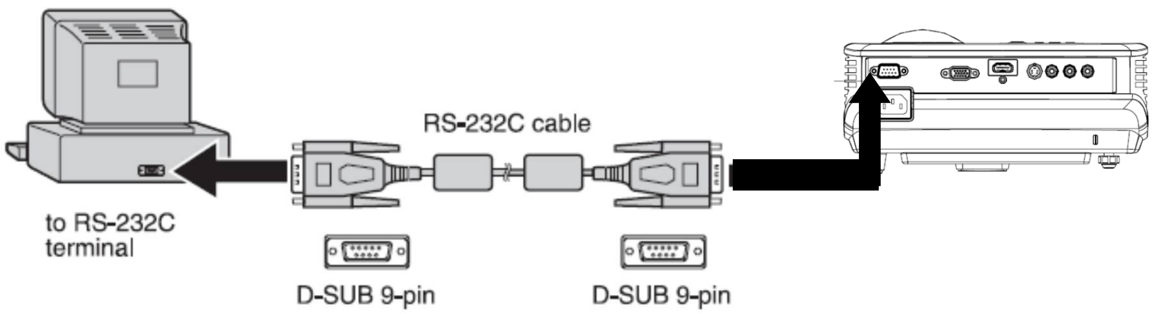
Software required

1. DLP Composer Lite program
2. New version FW

Download procedure

<Notice: Before download FW, make sure the adjusted values are read and kept by Service Tool.**>**

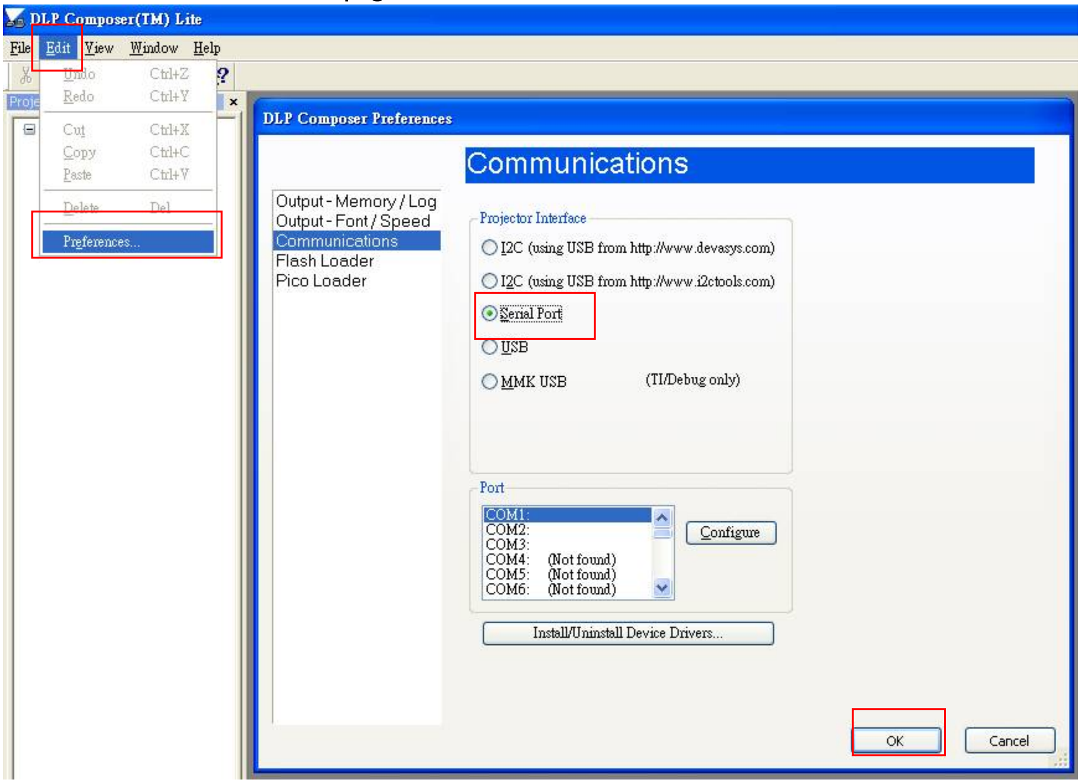
1. Connect RS-232 cable to PC and projector



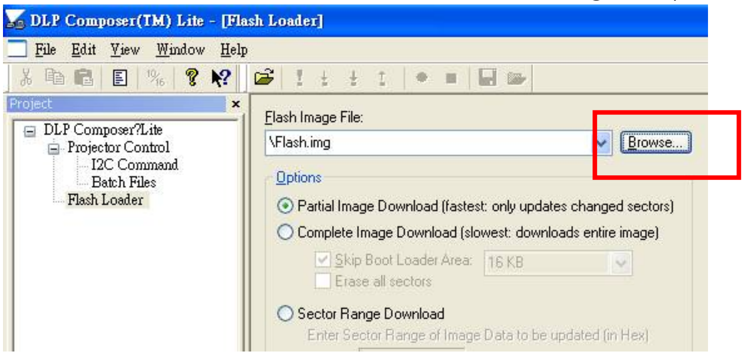
2. Let projector be in **Download Mode :**
   - Press and hold keypad-**POWER** and **AUTO** at the same time, then plug in power cord.
   - **Power/TEMP/LAMP** LED shows flash Red continuously.
3. Execute DLP Composer Lite 11.0 program

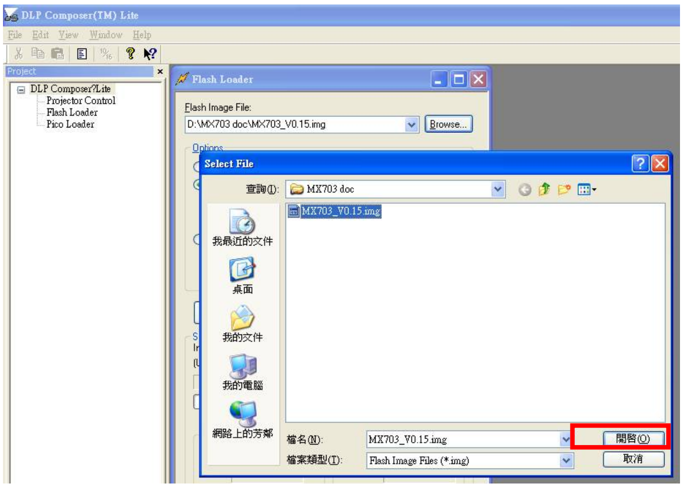


4. To select the RS-232 communications interface, choose "Preferences" from the "Edit" menu, click the "Communications" page and choose "Serial Port".

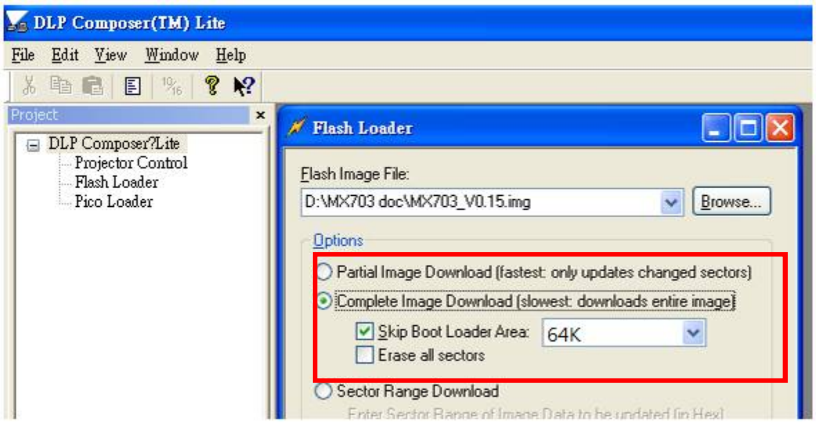


5. Click on "Flash Loader" and browse the image file (new version firmware)

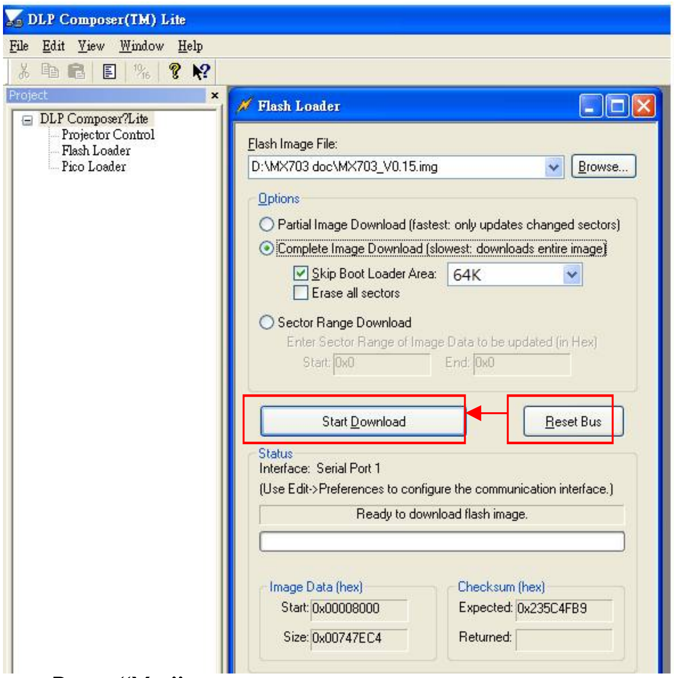




6. Select Complete Image Download, and make sure to check "Skip Boot loader area (64KB)"



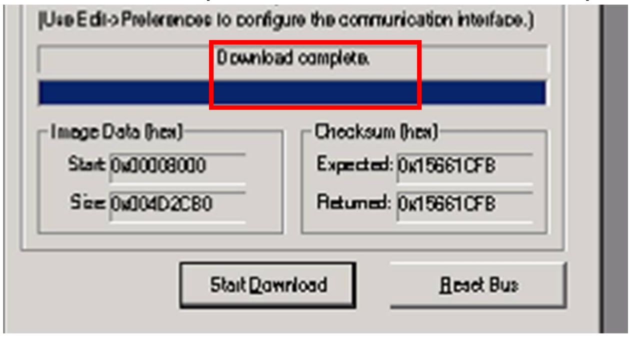
7. Press "Reset Bus" and check the status which should show "Bus Reset"
8. Press "Start Download" to begin update new firmware.



9. Press "Yes" to continue.



10. Wait till composer lite notice download complete.



<Notice: After download FW, make sure the adjusted values are written to projector by Service Tool.**>**

● How to download (Method-2 : By USB)

Hardware required

1. Standard USB Download cable(mini B type)
2. Personal computer or laptop computer

Software required

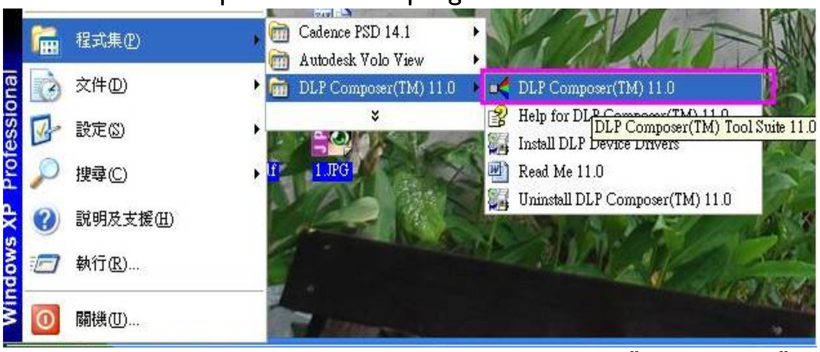
1. DLP Composer Lite program
2. New version FW

Download procedure

<Notice: Before download FW, make sure the adjusted values are read and kept by Service Tool.**>**

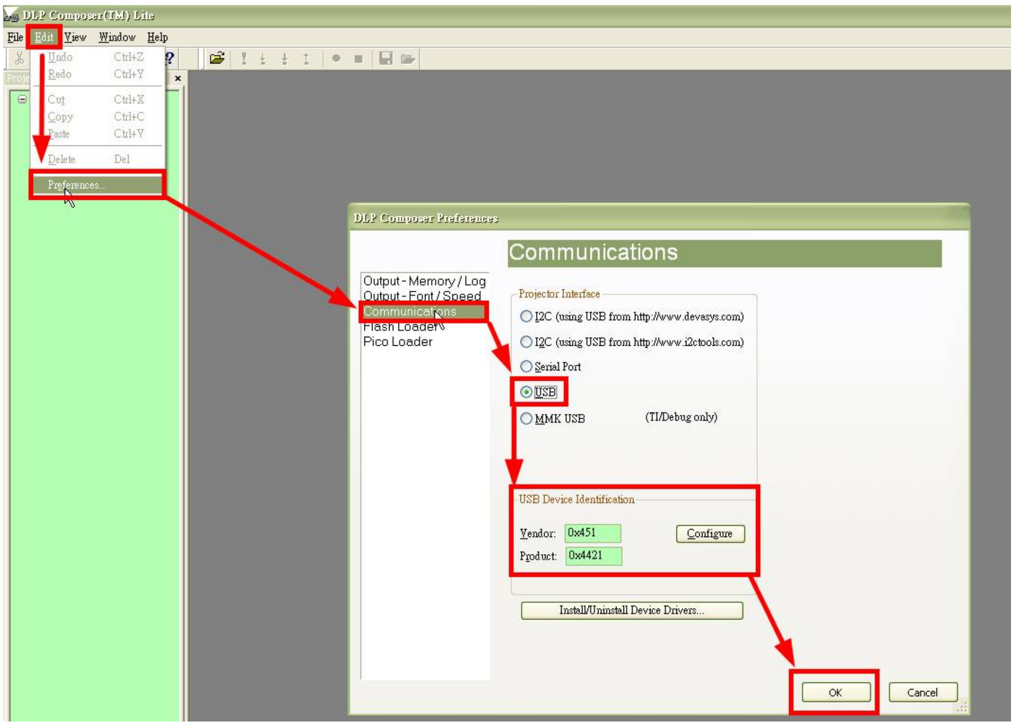
1. Connect USB cable to PC and projector
2. Let projector be in **Download Mode:**
   - Press and hold keypad-**POWER** and **AUTO** at the same time, then plug in power cord.
   - **Power/TEMP/LAMP** LED shows flash Red continuously.

3. Execute DLP Composer Lite 11.0 program

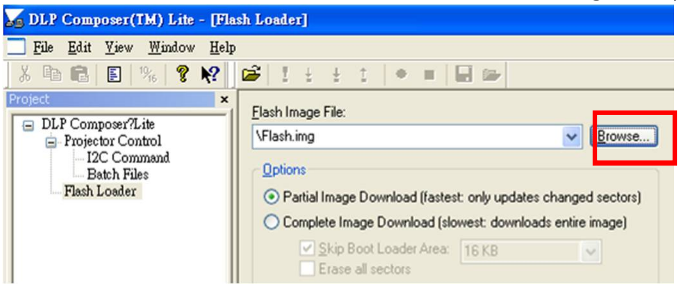


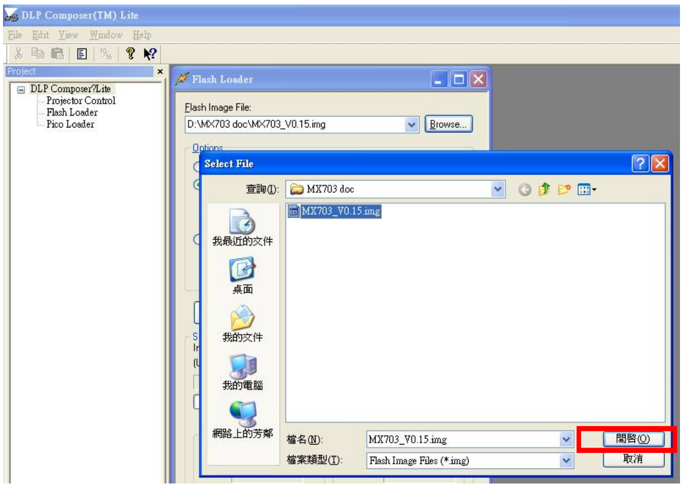
4. To select the USB communications interface, choose "Preferences" from the "Edit" menu, click the "Communications" page and choose "USB".

5. Check the USB Device Identification. Vendor should be **0x451**. Product should be **0x4421.**

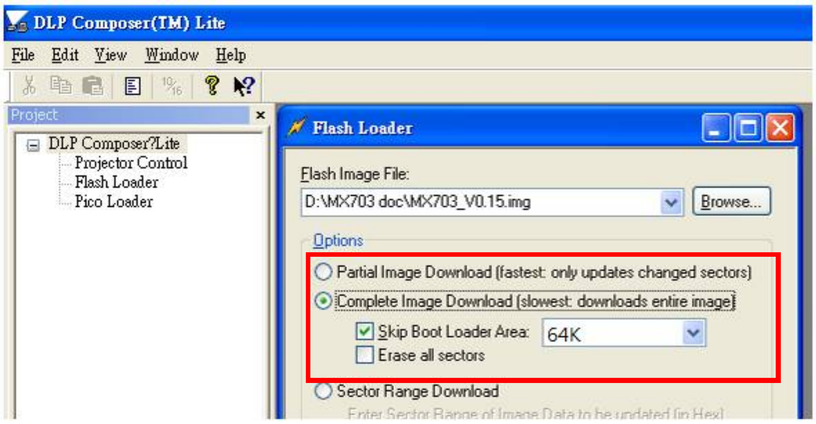


6. Click on "Flash Loader" and browse the image file (new version firmware)



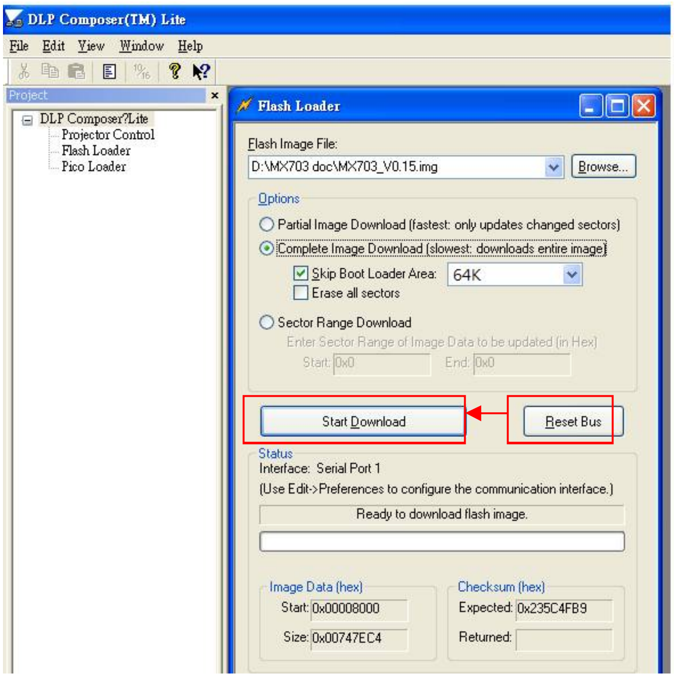


7. Select Complete Image Download, and make sure to check "Skip Boot loader area (64KB)"



8. Press "Reset Bus" and check the status which should show "Bus Reset"

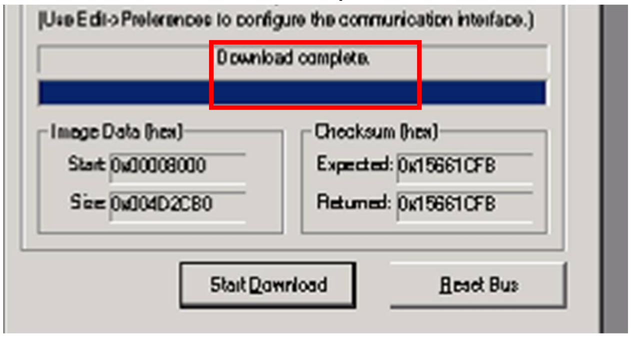
9. Press "Start Download" to begin update new firmware.



10. Press "Yes" to continue.



11. Wait till Download complete.



<Notice: After download FW, make sure the adjusted values are written to projector by Service Tool.**>**

(d) LAN (ATop) Firmware Download :

Condition：

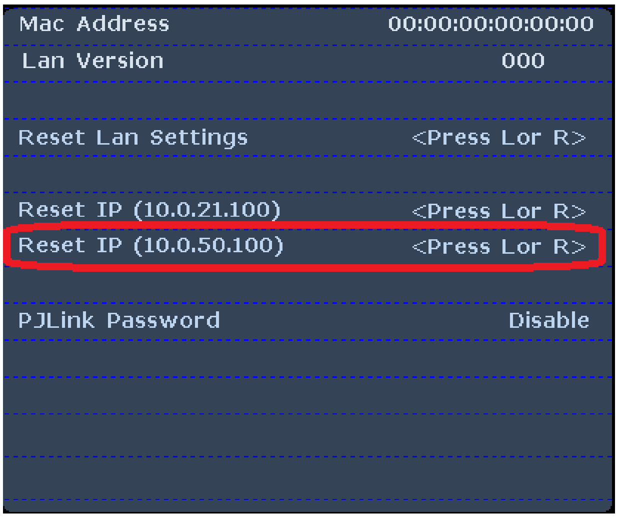
When it's necessary to download LAN Firmware.

Procedure：

<Projector Settings>

Step1: Reset projector IP address to default. Default IP is 10.0.50.100

(1) Enter Factory Page 7 to reset IP. (as below figure)

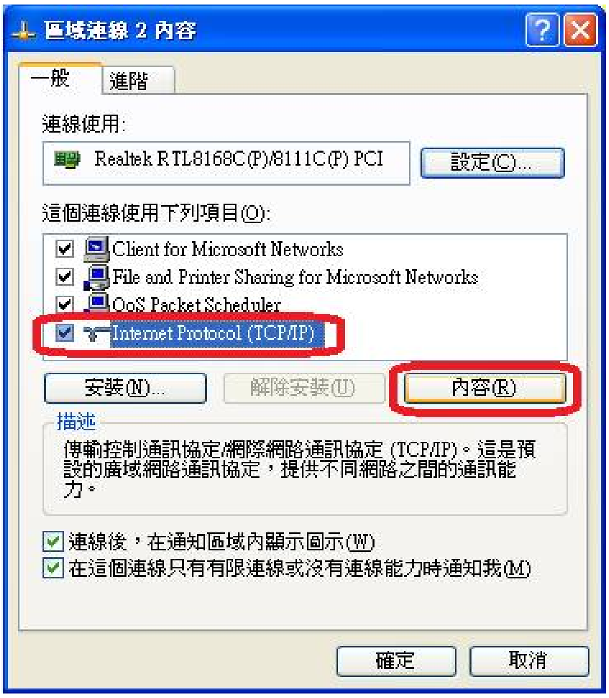


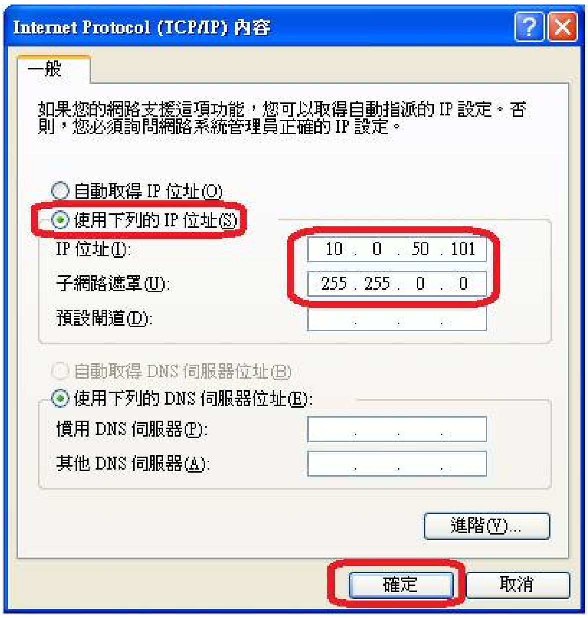
<PC Settings>

Step1: Please close firewall.

Step2: Set your PC IP address to 10.0.50.101







Step3: Go to Web page and change setting to

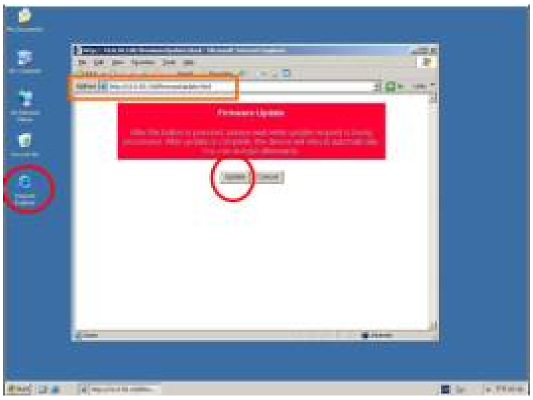




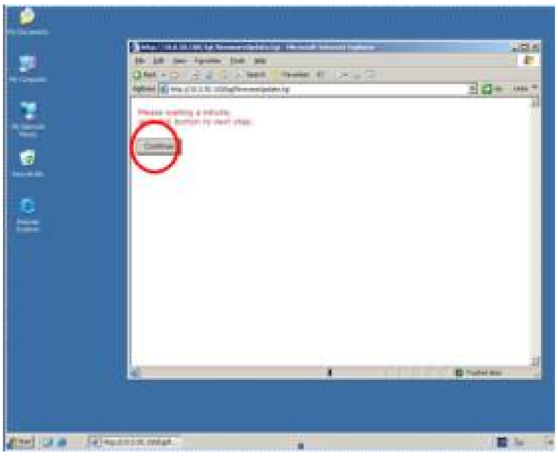
Step4: Open Internet Explorer

Step5: input Web address : http://10.0.50.100/firmwareUpdate.html

Step6: Press "Update" bottom



Step7: Select "Continue"



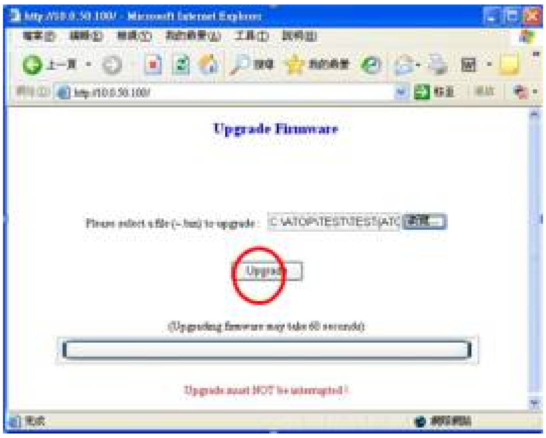
Step8: Press "explore" button to select firmware file.



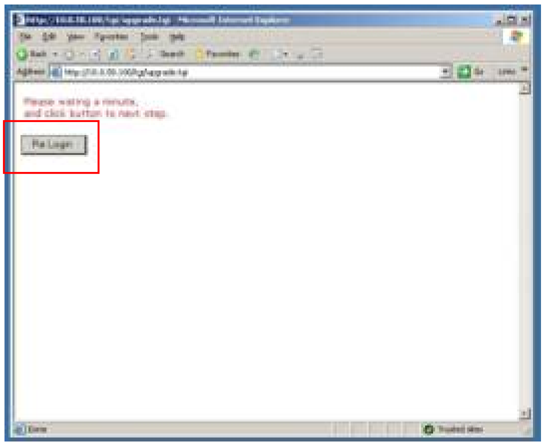
Step9: Select the firmware file.



Step10: Press "Upgrade" button, and start to download.



Step11: After finish it will show "Re Login" button. Press it go to next page.



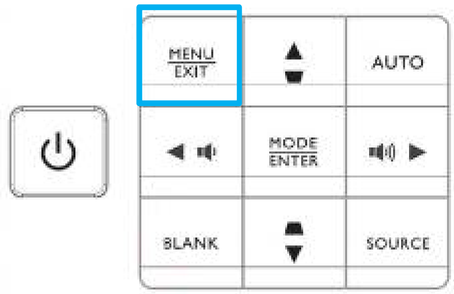
Note:

1. Use LAN cable to connect PC and projector directly.
2. If download finish and not show "Re Login", go to step4. Execute Firmware Update again.
3. If press "Re Login" and can't go to next page, go to Step4. Execute Firmware Update again.

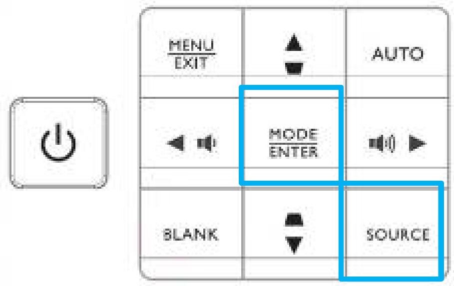
4.4 Factory Menu

Method to enter factory menu

1. Press Menu/EXIT on keypad than the main menu popup

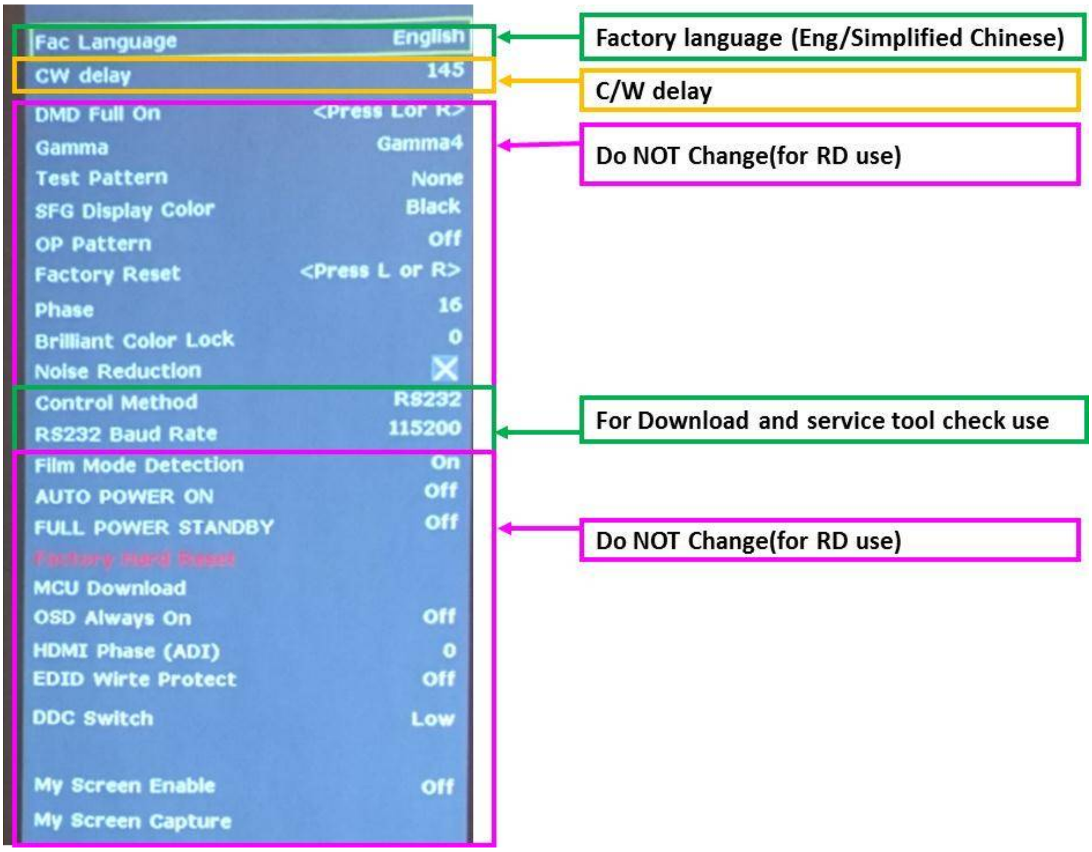


2. When showing main menu, press Source + Mode/ENTER at the same time

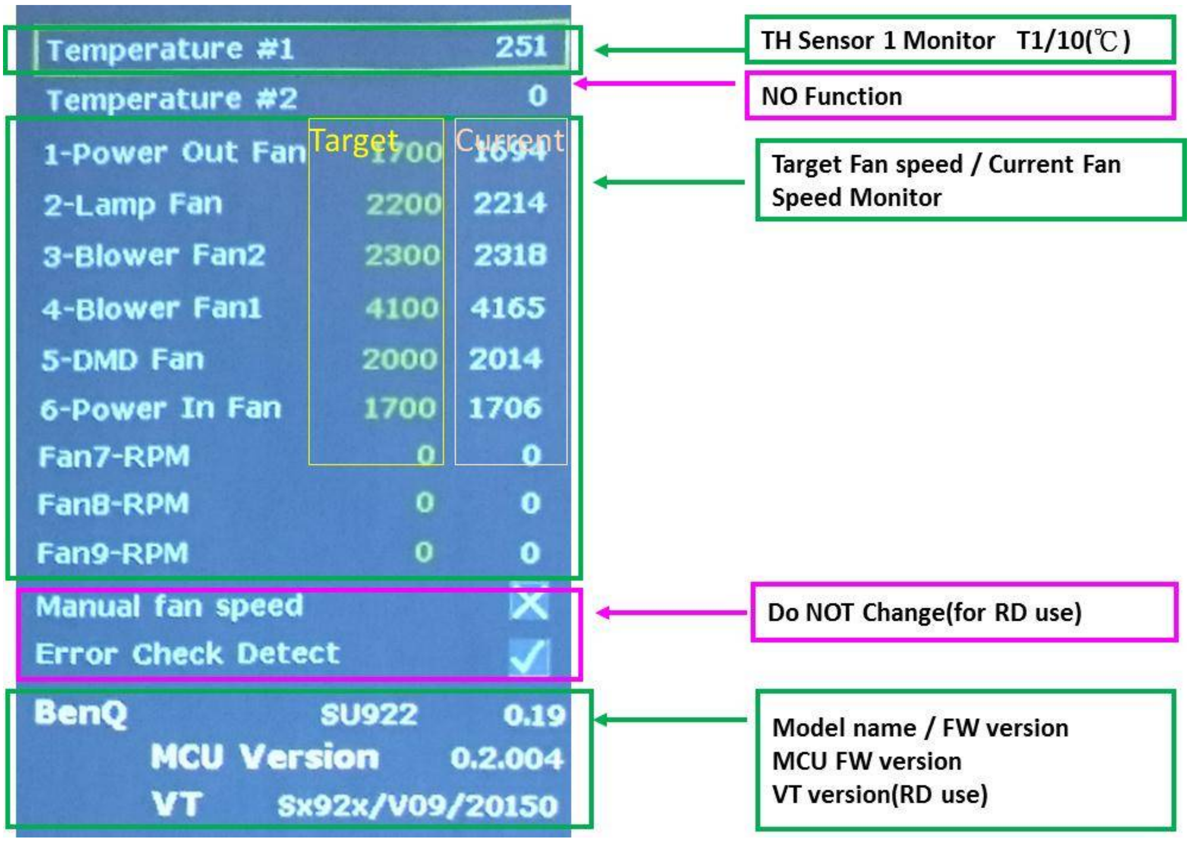


3. Factory menu popup at the top-left of display

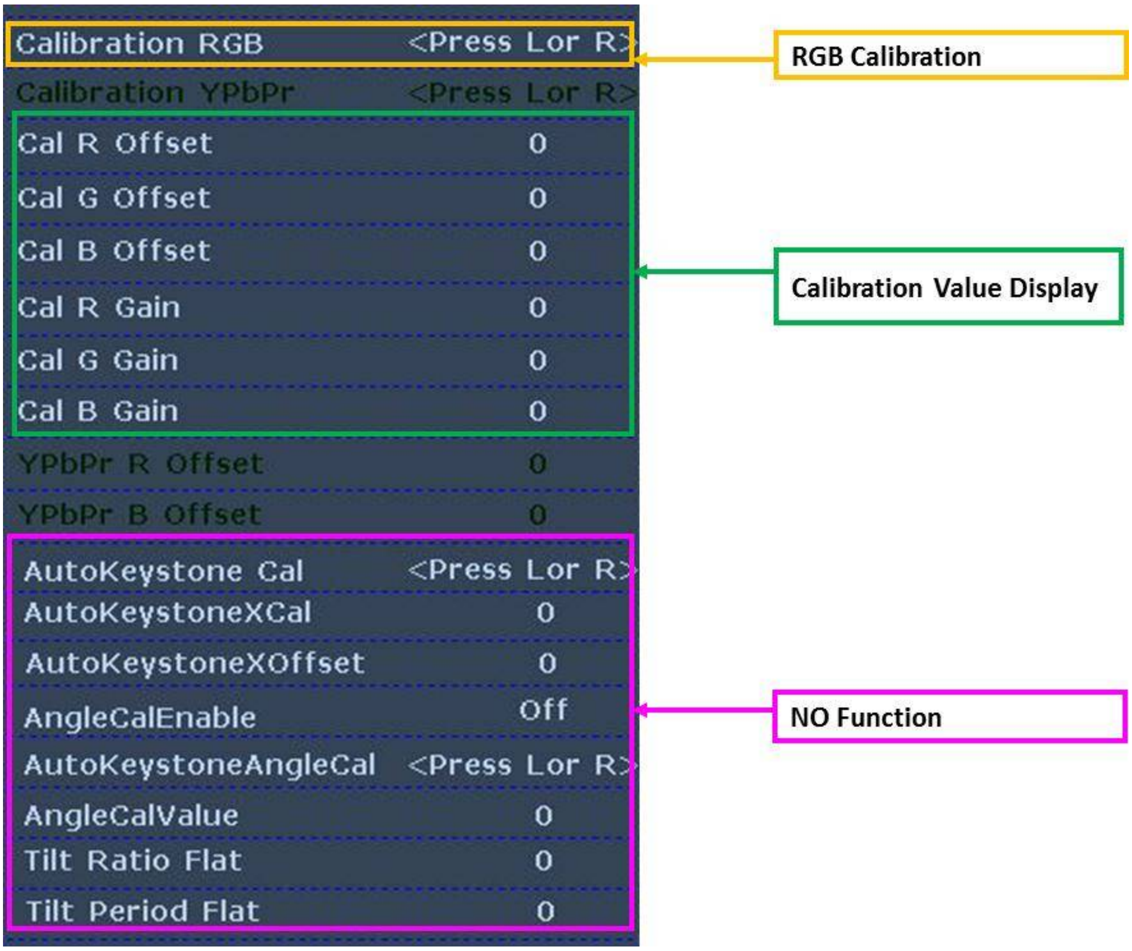
Page1:


Fac Language English
CW delay 145
DMD Full On <Press L or R>
Gamma Gamma4
Test Pattern None
SFG Display Color Black
OP Pattern Off
Factory Reset <Press L or R>
Phase 16
Brilliant Color Lock 0
Noise Reduction
Control Method RS232
RS232 Baud Rate 115200
Film Mode Detection On
AUTO POWER ON Off
FULL POWER STANDBY Off
MCU Download
OSD Always On Off
HDMI Phase (ADI) 0
EDID Wirte Protect Off
DDC Switch Low
My Screen Enable Off
My Screen Capture
Factory language (Eng/Simplified Chinese)
C/W delay
Do NOT Change(for RD use)
For Download and service tool check use
Do NOT Change(for RD use)

Page2:


Temperature #1 251
Temperature #2 0
Target
Current
1-Power Out Fan
2-Lamp Fan 2200 2214
3-Blower Fan2 2300 2318
4-Blower Fan1 4100 4165
5-DMD Fan 2000 2014
6-Power In Fan 1700 1706
Fan7-RPM 0 0
Fan8-RPM 0 0
Fan9-RPM 0 0
Manual fan speed
Error Check Detect
BenQ SU922 0.19
MCU Version 0.2.004
VT Sx92x/V09/20150
TH Sensor 1 Monitor T1/10(℃)
NO Function
Target Fan speed / Current Fan Speed Monitor
Do NOT Change(for RD use)
Model name / FW version
MCU FW version
VT version(RD use)

Page3:

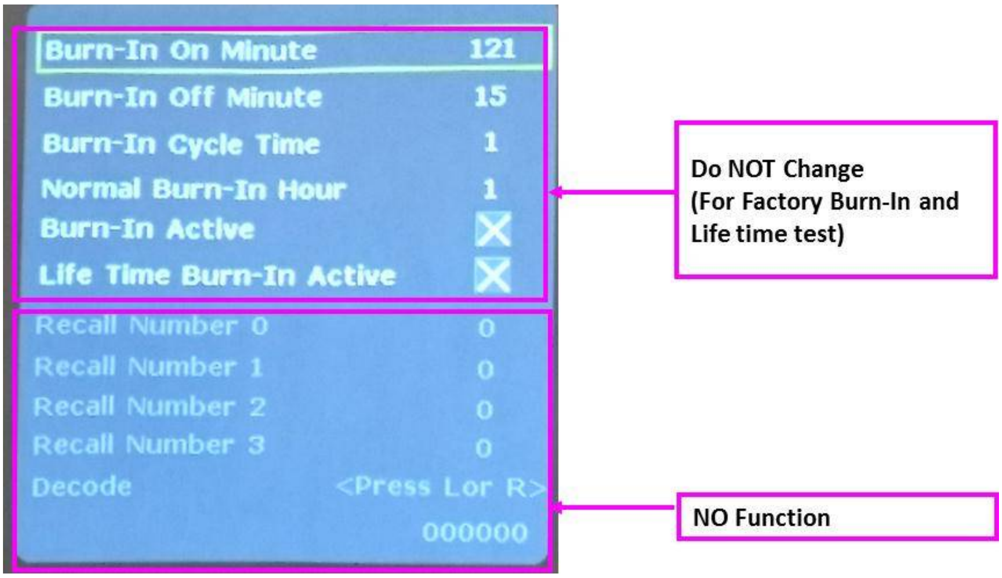


Page4:

Error Count :



Page5:

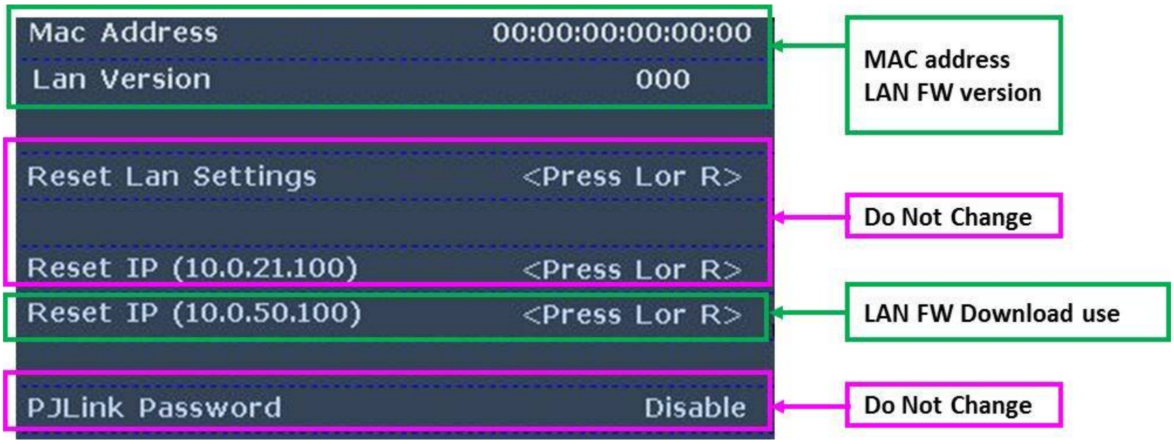


Page6:



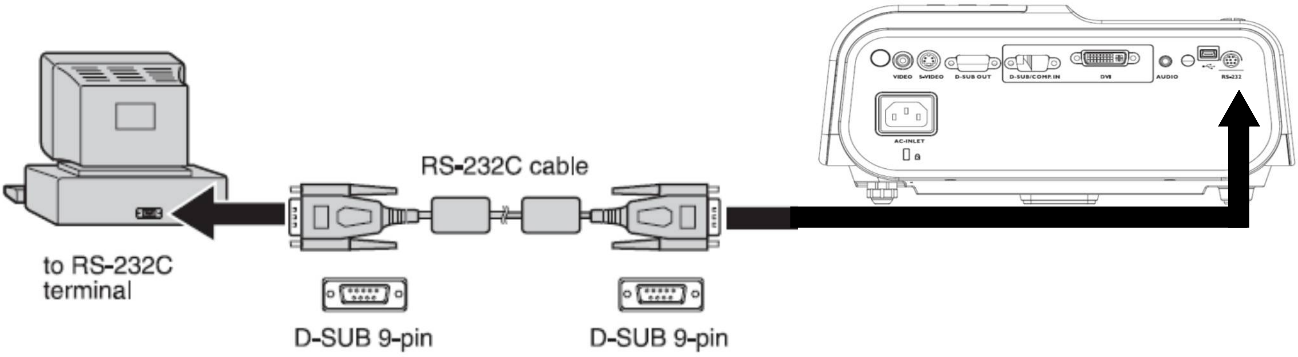
Note: Reset all hours will also reset the "Lamp Time" on OSD

Page7:


Mac Address
00:00:00:00:00:00
Lan Version
000
Reset Lan Settings
<Press Lor R>
Reset IP (10.0.21.100)
<Press Lor R>
Reset IP (10.0.50.100)
<Press Lor R>
PJLink Password
Disable
MAC address
LAN FW version
Do Not Change
LAN FW Download use
Do Not Change

4.5 RS-232 connection

1. Below shows the illustration of connection between PC and Projector.

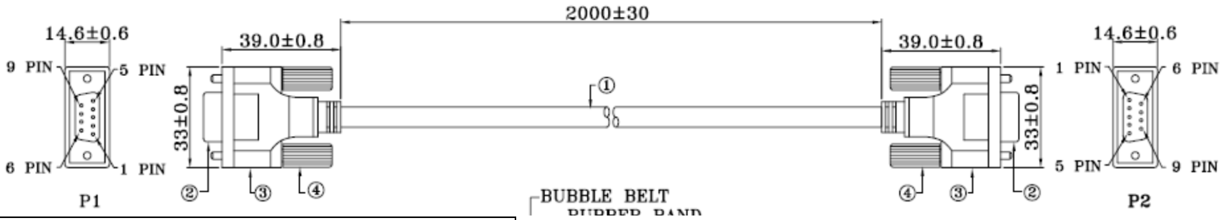


<CAUTION>

- ◆ Make sure that your computer and projector are turned off before connection.
- ◆ Power on the computer first, and then plug the power cord of the projector. (It may cause Com port incorrect function, if you do not follow this instruction)
- ◆ Adapters may be necessary depending on the PC connected to this projector. Please contact with your dealer for further details.

2. Hardware connection

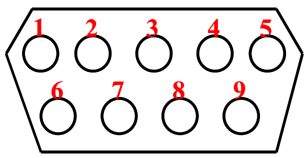
<Download cable 1>



WIRE ARRANGEMENT		
P1	COLOR	P2
1	BLACK	1
2	BROWN	3
3	RED	2
4	ORANGE	4
5	YELLOW	5
6	GREEN	6
7	BLUE	8
8	PURPLE	7
9	GRAY	9
CASE	DRAIN WIRE	CASE

<pin assignment for this two end>

Pin	Description	Pin	Description
1	NC	2	RXD
3	TXD	4	NC
5	GND	6	NC
7	RTS	8	CTS
9	NC		



Interface Settings

RS-232 protocol	
Baud Rate	115200 bps (default) Changeable settings in User OSD (2400/4800/9600/14400/19200/38400/57600/115200)
Data Length	8 bit
Parity Check	None
Stop Bit	1 bit
Flow Control	None

Software specification

1. When input cmd fail, e.g. correct input is "*pow=?#" but input "*po=?#", or input "*mute=on#" while projector is already mute, it will show "*Illegal format#".
2. When input cmd but projector has no such function item, e.g. input "*sour=RGB2#" but projector has no RGB2 connector, it will show "*Unsupported item#".
3. When cmd and function are both workable, but it's not under the status which cmd can be executed, e.g. input "*asp=4:3#" while not connecting source, it will show "*Block item#".
4. When input "query" cmd (with "?"), e.g. input "*sour=?#", it will echo the same input strings with some value.
5. Press "Enter" key after" ＞", it should be no echo and skip to the next row.
6. Press "Space" and "Enter" key after" ＞", it will echo"*Illegal format#"

3. Procedure of operation by HyperTerminal

Hardware requirement

- RS232 cable
- Desktop or laptop with DB-9 connector

Software requirement

HyperTerminal – included in Microsoft Windows operating system

Procedure

Step1. Connect projector and computer via a RS232 cable
Step2. Turn on projector
Step3. Create a connection between computer and projector by HyperTerminal

a. Open "HyperTerminal"
b. Enter a name for this connection



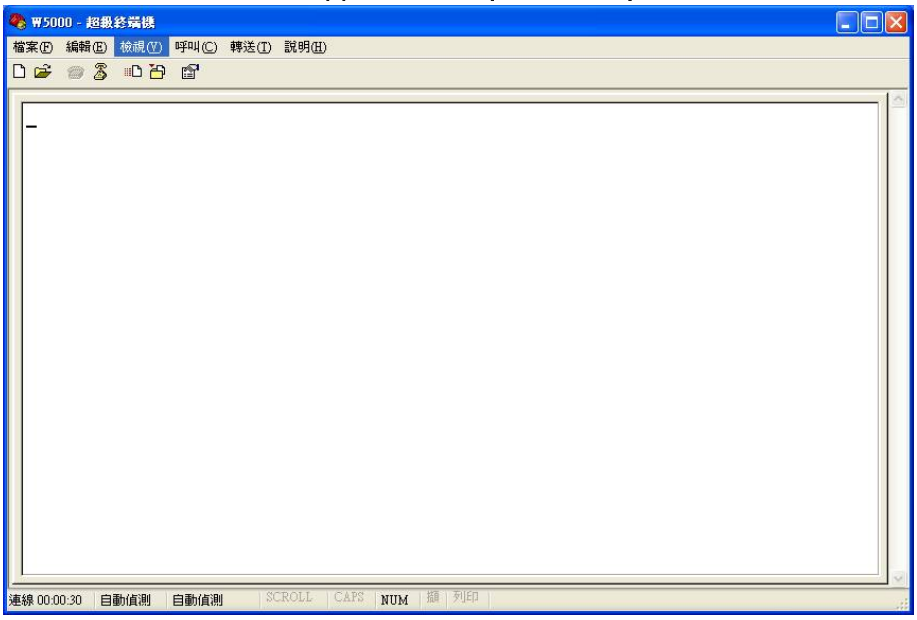
c. Select a permitted COM port – COM1 usually



d. Select "115200" bps for baud rate; other setting is default

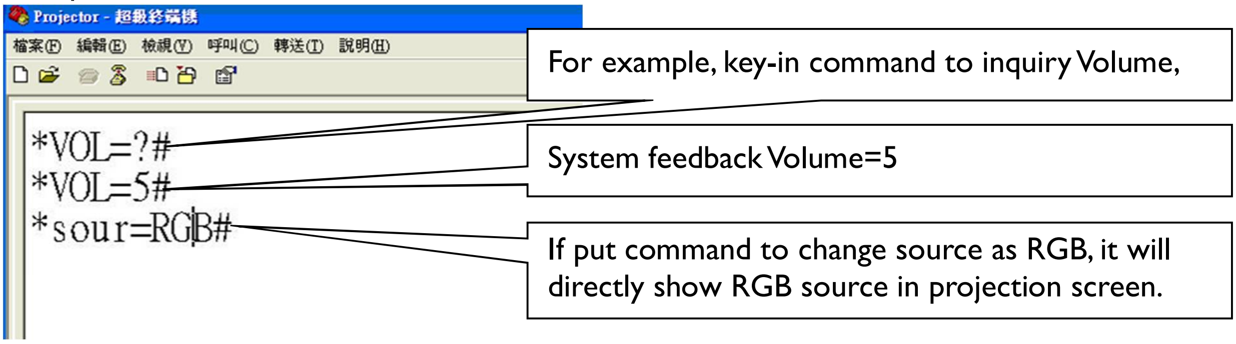


e. The terminal window appears, then you can key-in commands.



f. Input a valid RS232 command at terminal window, and press "Enter", projector will receive

command and act. (RS232 command refer to Appendix-RS232 command list)
Example as below :



Command Category

Refer to Appendix 2

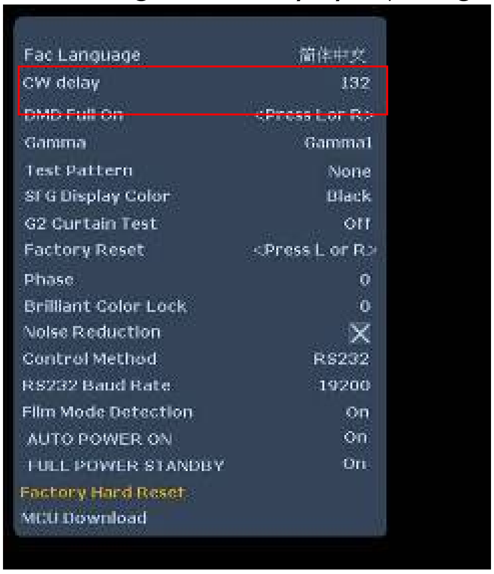
4.6 Adjustment / Alignment Procedure

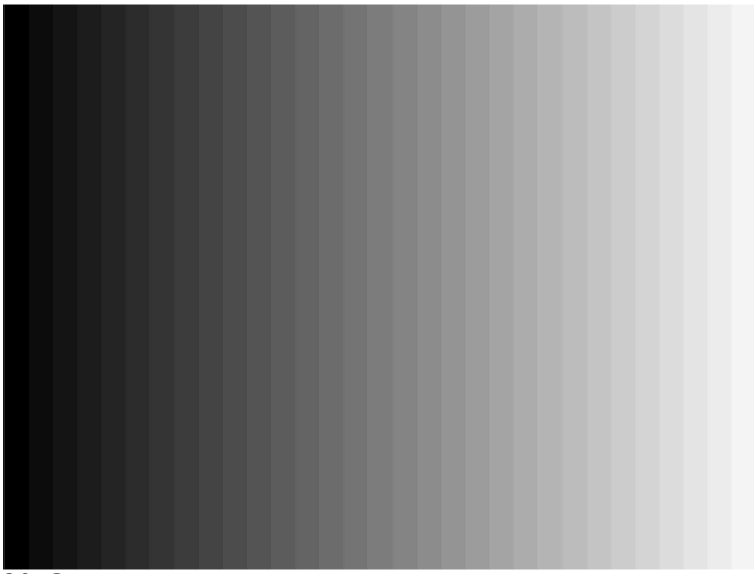
Content

4.6.1. Color Wheel Delay Alignment

Procedure:

1. Enter Factory Mode
2. Enter Block I
3. Change CW Delay by adjusting the following gray pattern to smooth

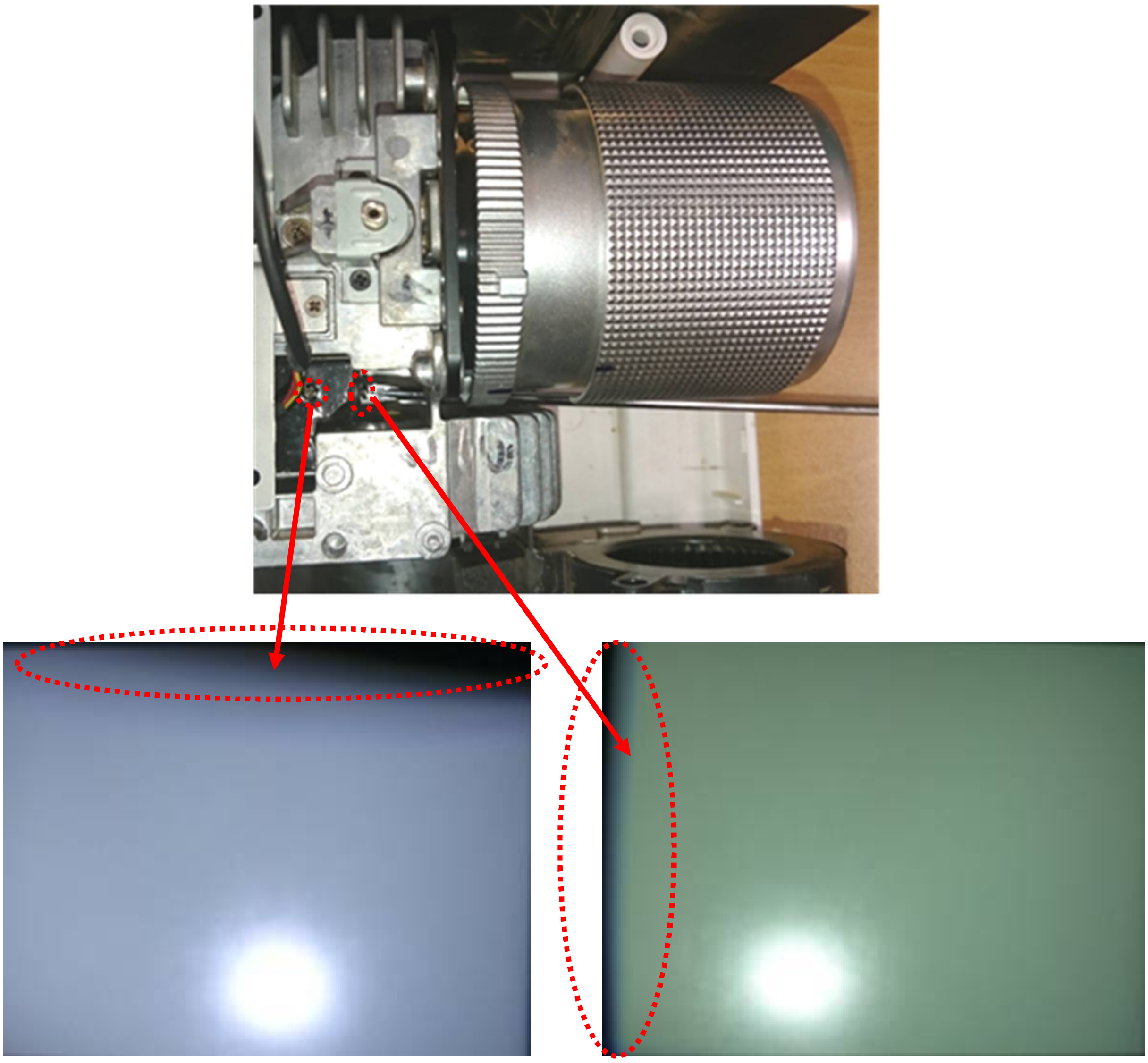




32 Gray pattern

4.6.2. Overfill adjustment

1. "Full White Pattern" is suggested for this alignment.
2. Adjust 2 Overfill adjustment screws (upper side / lower front side of Optical Engine) behind Color Wheel.
   (Notice: Suggest taking off Upper case and Front case before adjustment. After finishing adjustment, then assemble the Upper case and Front case.)
3. Alignment Criteria is to adjust these 2 screws until "No Dark Edges" and "No Shadows" can be observed in image.



4.6.3 PC Alignment Procedure

Condition: When 32 gray level image is abnormal or not smooth.

Equipment：

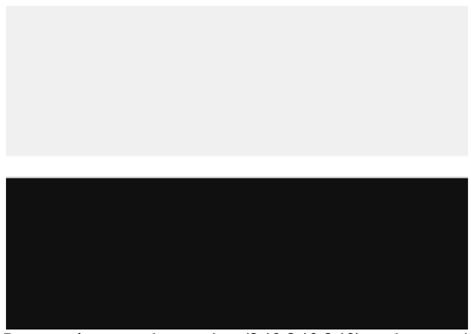
- Pattern generator or PC with standard output
  (Notice: If uses PC, the signal level is calibrated to this PC)
- Source = Compuetr-1 : use standard D-sub cable

OSD Default value：

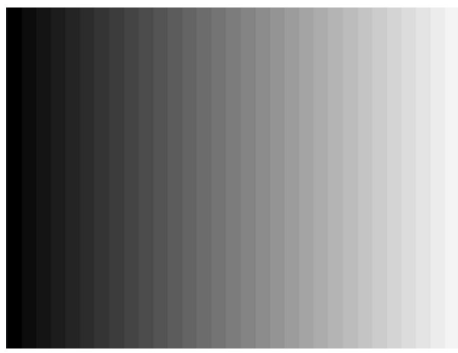
Item	Value
Cal R Offset	512
Cal G Offset	512
Cal B Offset	512
Cal R Gain	1024
Cal G Gain	1024
Cal B Gain	1024

Procedure：

1. Connect power cord and **PC D-sub source** into projector to Component-1.
2. Turn on projector.
3. Change **Timing** of pattern generator:
   Timing: **1024x768 @60Hz**
4. Change Pattern of pattern generator:
   Pattern: Full frame pattern, ex.pattern1
5. Press "Auto" to catch the full screen
6. Change Pattern of pattern generator:
   Pattern: **A near white color (240,240,240) and a near black color (16,16,16). The center white color is (255,255,255)**
7. Enter Factory mode, block 3
8. Press "**Calibration RGB <Press L or R>**" to let the black level to just distinguish, and the light output of white level to just max.
9. Check the 32 levels of gray pattern. All steps must appear.
10. Done



Pattern: A near white color (240,240,240) and a near black color (16,16,16). The center white color is (255,255,255).



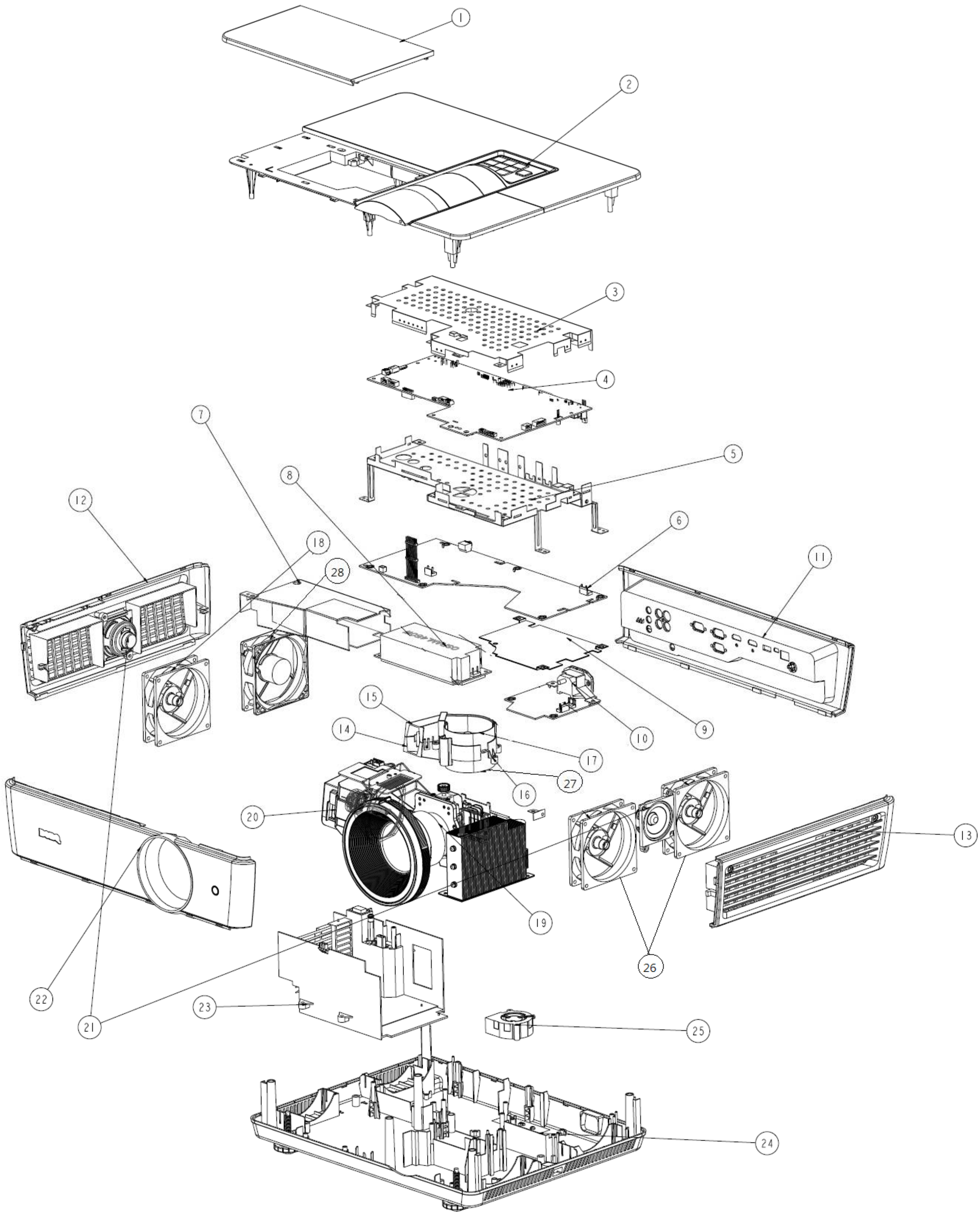
Pattern: 32 gray level

5. Level 2 Circuit Board and Standard Parts Replacement

5.1 Product Exploded View

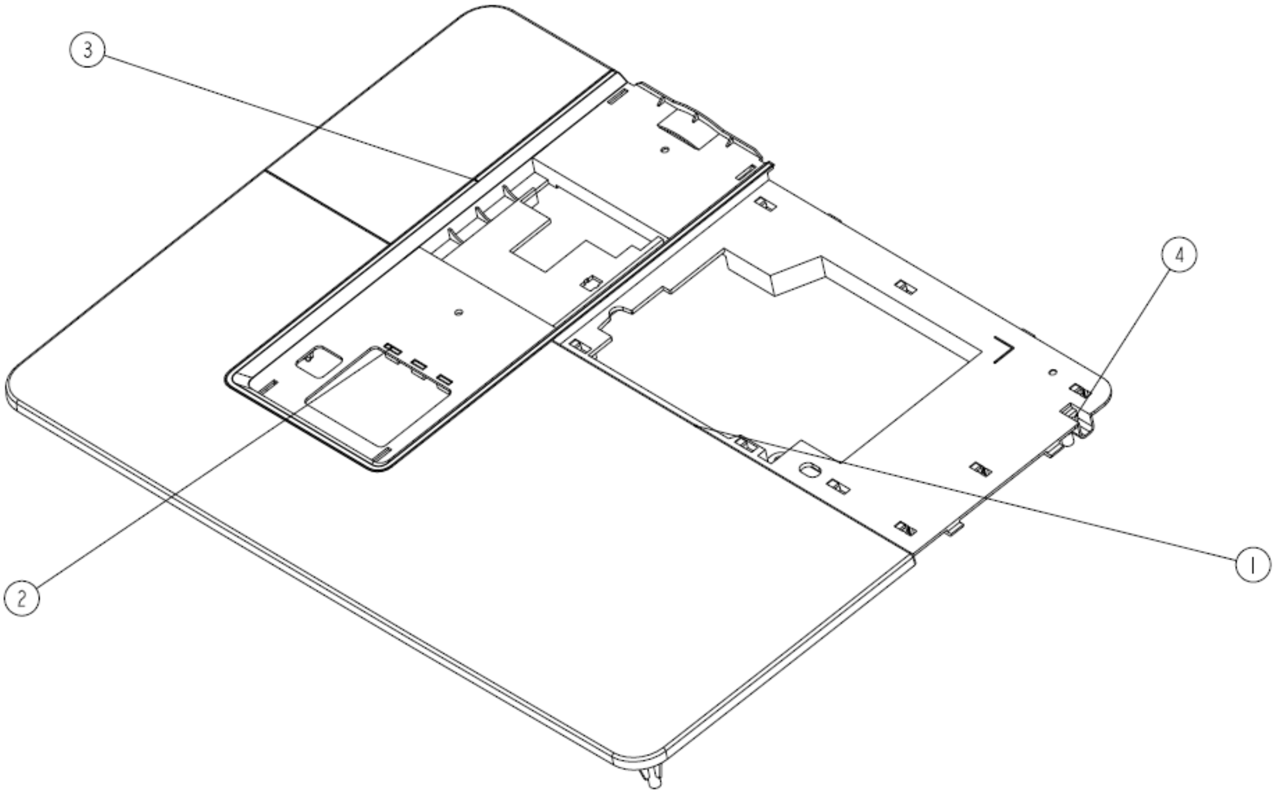
Module 1 – Total Exploded View

NO.	DESCRIOTION	Q'TY
1	ASSY DOOR LAMP SX930	1
2	ASSY SUB CASE UPPER SX930	1
3	SHD MAIN BD SPTE SX914	1
4	MAIN BOARD	1
5	SHELF MB SX930	1
6	POWER BOARD	1
7	MYLAR BALLAST SX930	1
8	BALLAST BOARD	1
9	MYLAR EMI BD SX930	1
10	EMI BOARD	1
11	ASSY CASE REAR SX930	1
12	ASSY SUB CASE OUTLET SX914	1
13	ASSY SUB CASE INLET SX930	1
14	NOZZLE BTM SX930	1
15	NOZZLE TOP SX930	1
16	FRAME BLOWER SX930	1
17	FAN 70*70*25 110MM AB07012HX	1
18	FAN 92*92*25 125MM AD0912XB	1
19	ENG MODULE	1
20	LAMP MODULE	1
21	SPEAKER 10W	2
22	CASE FRONT PC SX914	1
23	ASSY SUB LAMP BOX SX930	1
24	ASSY SUB CASE LOWER SX930	1
25	FAN 50*50*20 310MM BUB0512HD	1
26	FAN*2 92*25 115/45 AD0912XB/UX	1
27	FAN 70*70*25 250MM AB07012HX	1
28	FAN 92*92*25 70MM AUB0912VH-CF	1


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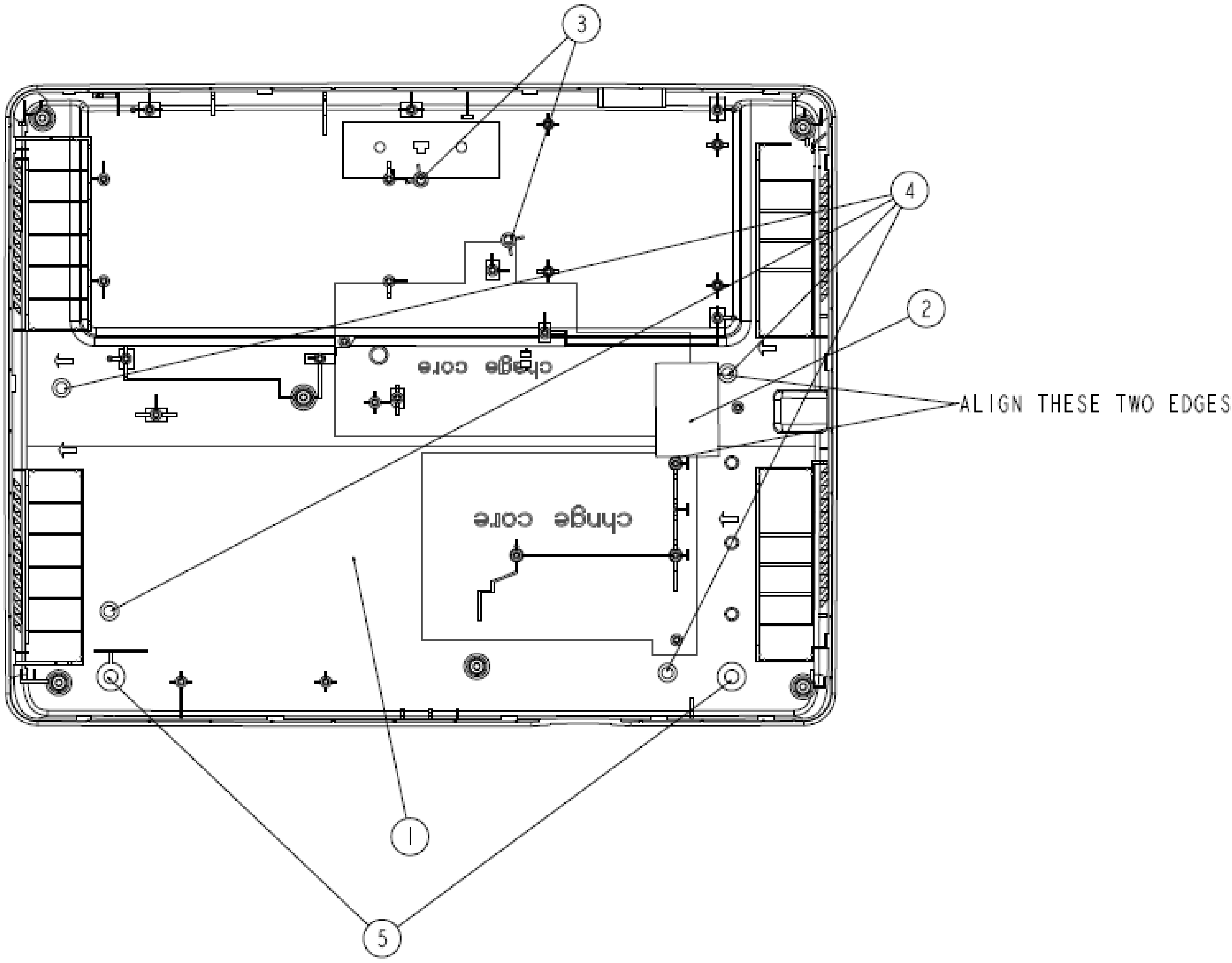
Module 2 – ASSY UPPER CASE

ITEM	DESCRIPTION	Q'TY	REMARK
1	CASE UPPER PC SX930	1	
2	LENS LED ABS SX914	1	MELT IN
3	decoratiob part SX914	1	MELT IN
4	NUT INSERT M3*5L D4.6 BRASS	1	MELT IN

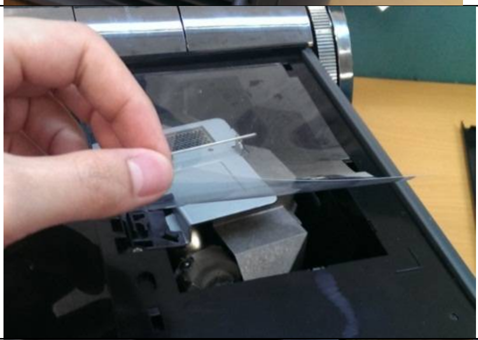


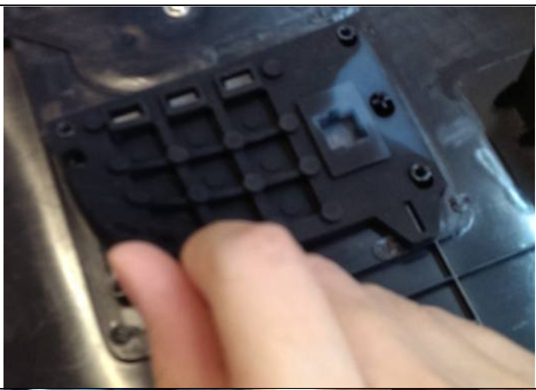
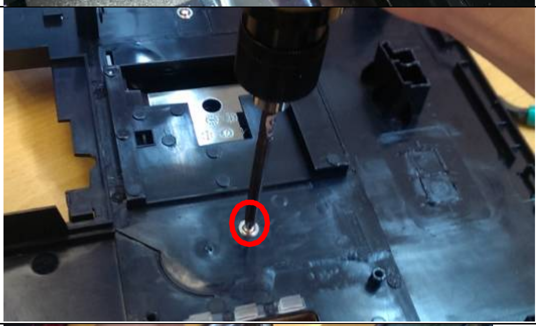
Module 3 – ASSY LOWER CASE

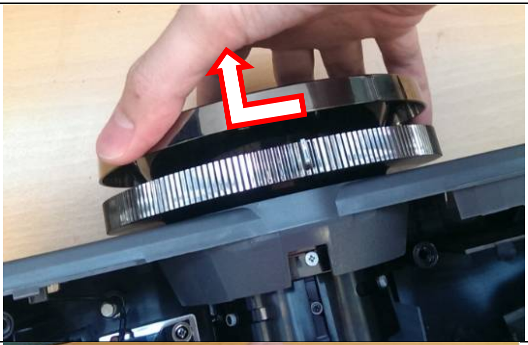
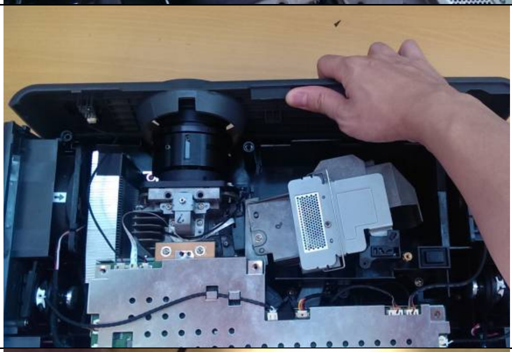
ITEM	DESCRIPTION	Q'TY	REMARK
1	CASE LOWER SU931	1	
2	GASKET 46*31*6 MM SX914	1	
3	NUT INSERT M3*5L D4.6 BRASS	2	MELT IN
4	NUT INSERT M4*15L D6.3 BRASS	4	MOLD IN
5	NUT INSERT M8*10.24*12.65L	2	MOLD IN

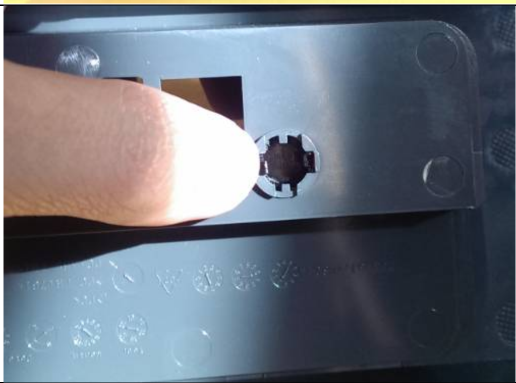


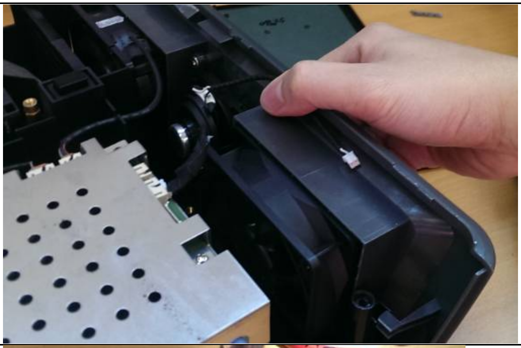
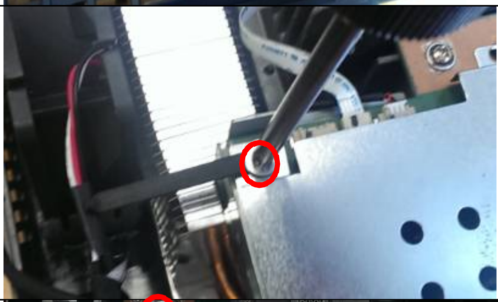
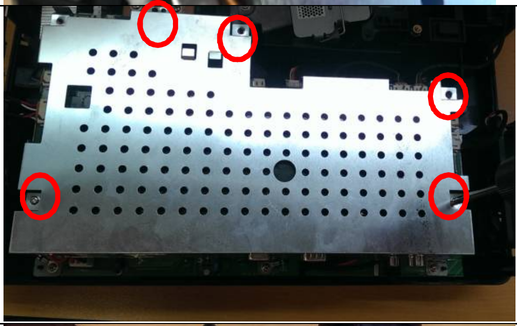
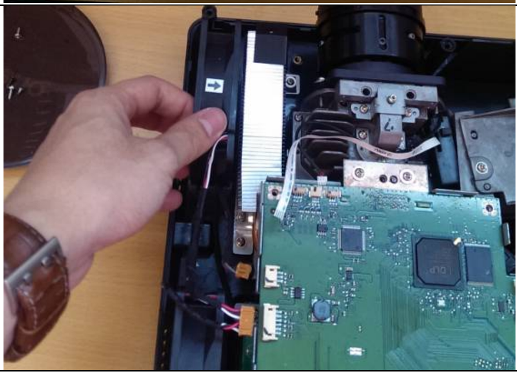
5.2 Product Disassembly / Assembly

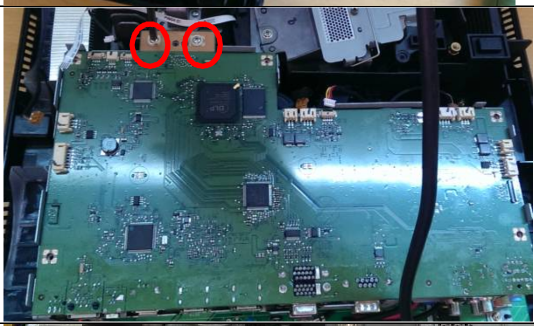
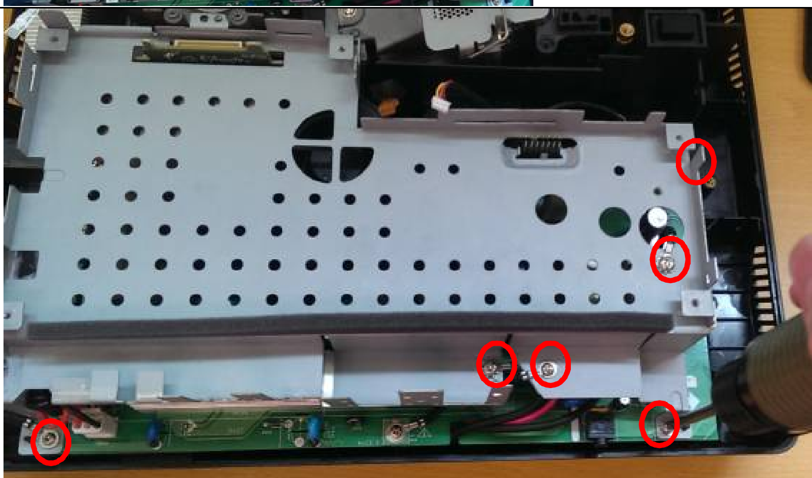
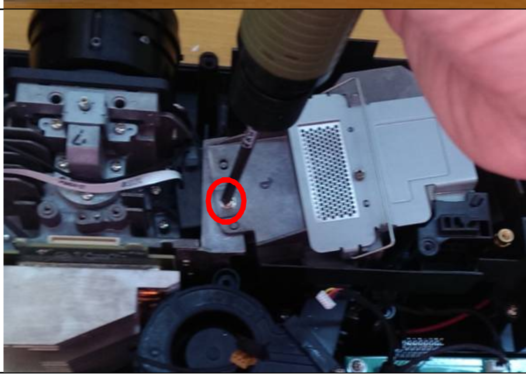
Seq	Figure	Step
1.		Disassemble lamp door
2.		Disassemble mylar
3.	 	Disassemble the upper case
4.		Disassemble the keypad board

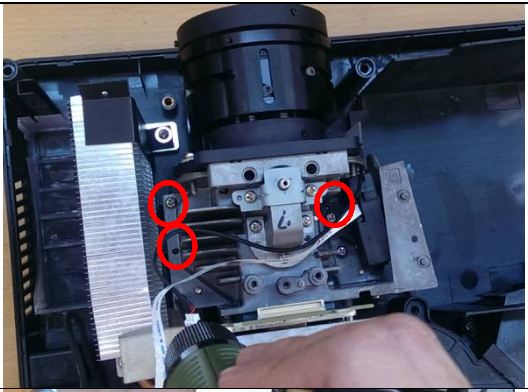
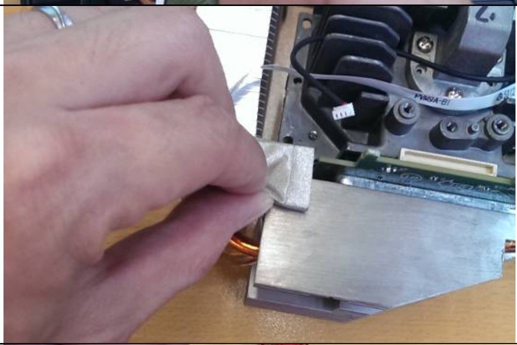
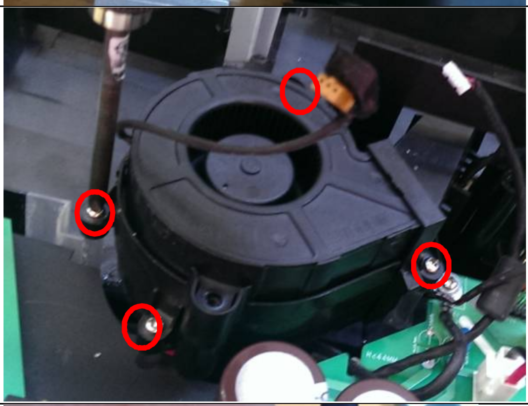
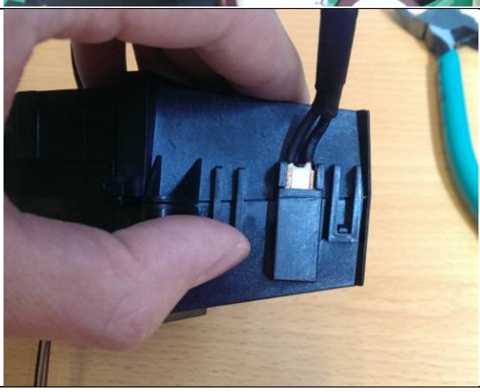
5.		Disassemble the rubber keypad
6.		Disassemble the door lock
7.		Disassemble the zoom/ focus ring cover
8.		Disassemble the lens shift cover
9.		Disassemble the keypad mylar

10.		Disassemble the focus ring
11.		Disassemble the zoom ring
12.		Disassemble the case front
13.		Disassemble the IR board
14.		Disassemble the lens IR front

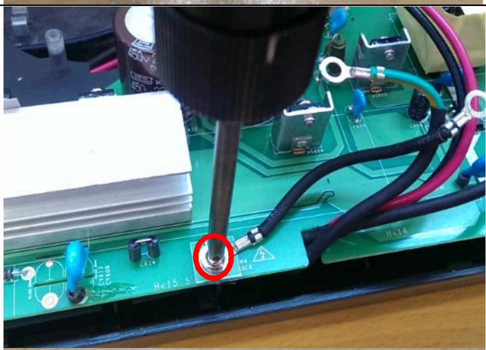
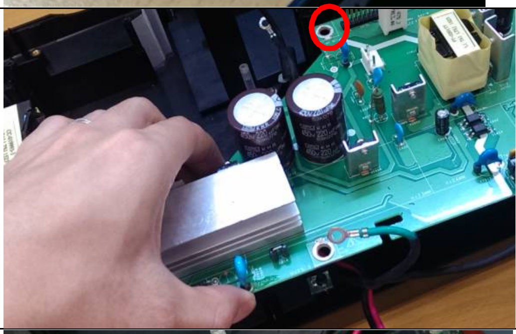
15.		Disassemble the mylar logo
16.		Disassemble the case rear
17.		Disassemble lens IR rear
18.		Disassemble the case inlet
19.		Disassemble the speaker

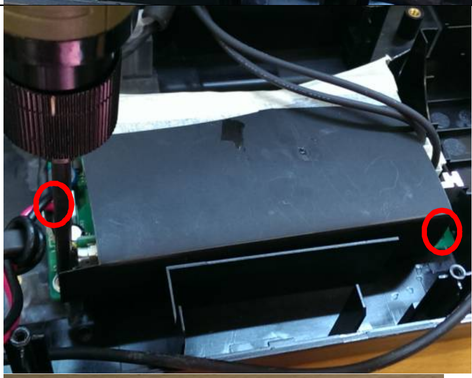
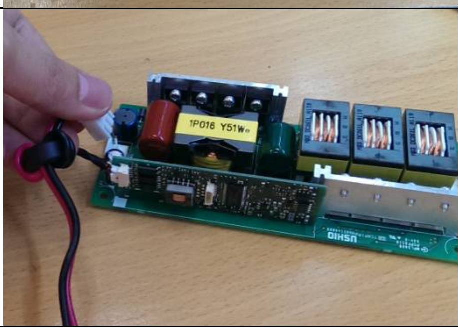
20.		Disassemble the case outlet
21.		Disassemble the speaker
22.		Disassemble the wire dresser
23.		Disassemble the SHD MB
24.		Disassemble the fan inlet

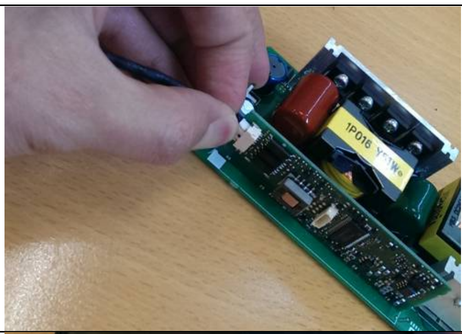
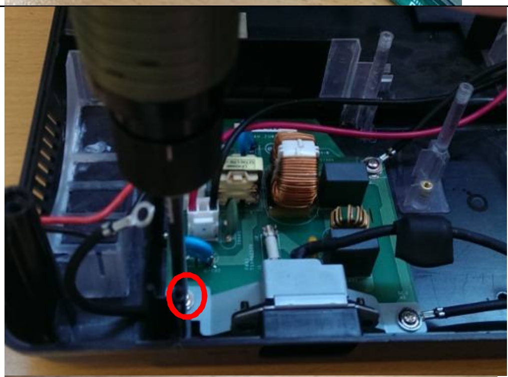
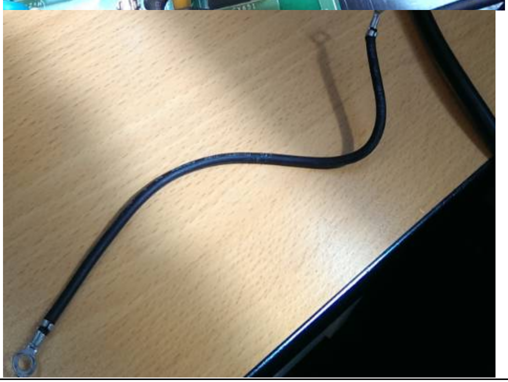
25.		Disassemble the lamp fan
26.		Disassemble the fan power outlet
27.		Disassemble the main board
28.		Disassemble the BKT MB
29.		Disassemble the lamp module

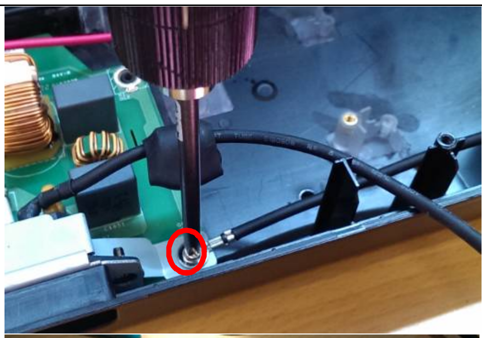
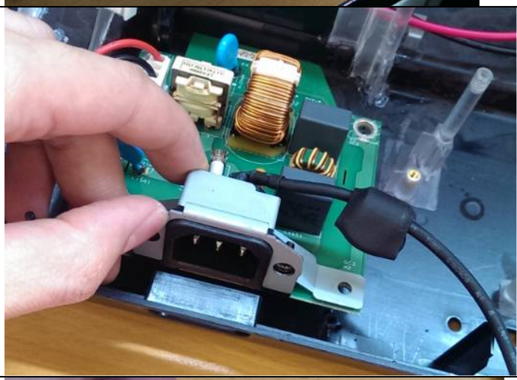
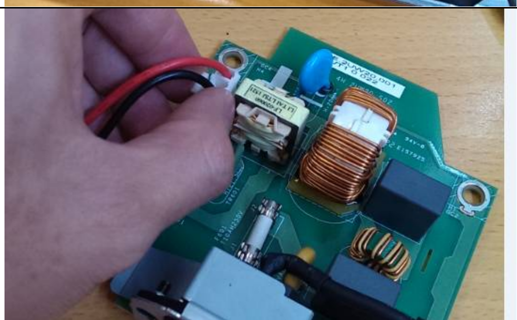
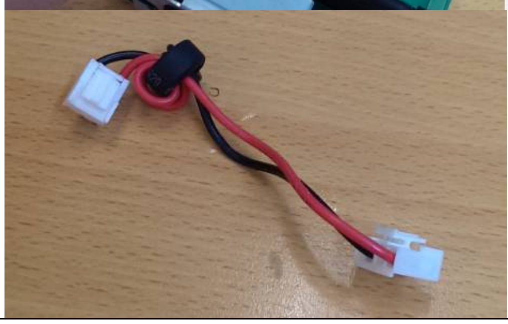
30.		Disassemble the ENG module
31.		Disassemble the sponge
32.		Disassemble the mylar
33.		Disassemble the blower module
34.		Disassemble the nozzle top

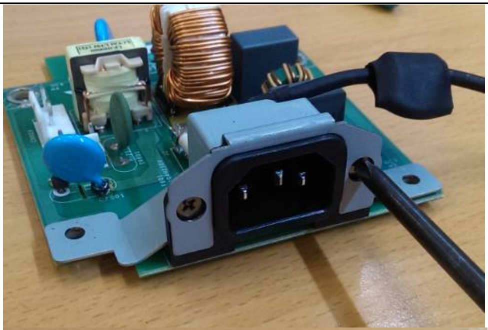
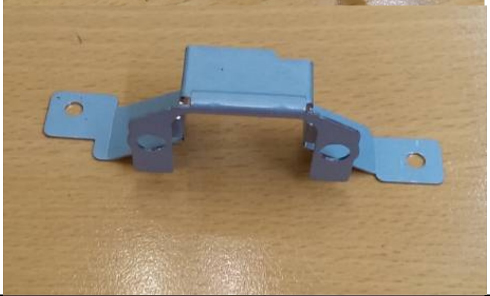
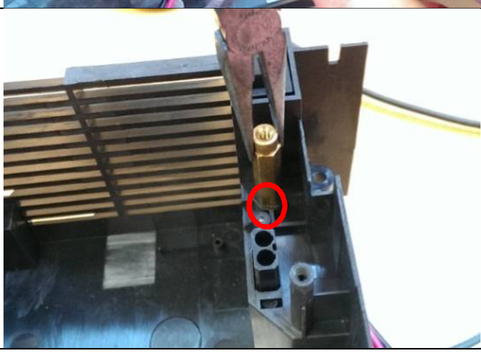
35.		Nozzle bottom
36.		Frame thermal breaker
37.		Thermal breaker
38.		Disassemble the blower bottom
39.		Disassemble the blower top

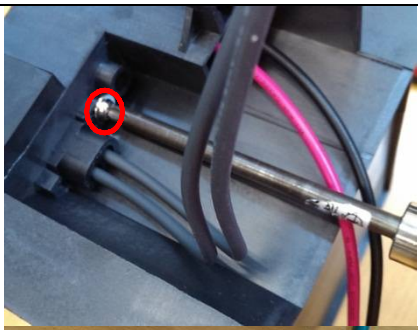
40.		The frame blower
41.	 	Disassemble the grounding wire
42.		Disassemble the power board
43.		Disassemble the mylar EMI

44.		Disassemble the blower BST
45.	 	Disassemble the ballast board
46.		Mylar BST
47.		Disassemble the wire BST to PWR

48.		Disassemble the wire BST to MB
49.	 	Disassemble the grounding wire
50.	 	53.Disassemble the grounding wire

51.	 	Disassemble the grounding wire
52.		Disassemble EMI board
53.	 	Disassemble the wire ESD board to PWR

54.	 		Disassemble the BKT EMI BD
55.			EMI BD
56.			Disassemble the lamp box
57.			61.Disassemble the stand off

58.	 	Disassemble the lamp wire
59.	 	Disassemble the door switch
60.		Disassemble the rubber foot
61.	 	Disassemble the foot pin
62.	 	Disassemble the front foot

63.		Disassemble the wire dresser
64.		Disassemble the sponge
65.		Lower case

5.3 Module Assembly Key Point - Optical Engine

1. Light Pipe Module assembly and overfill alignment

1.1 Assembly LP Module to HSG DMD

i. Assembly two Overfill adjustment screws (M3) to HSG DMD (Fig. 1-1).

** Adjustment criteria refer to below item 1.2 & (Fig. 1-2).

ii. Press CLIP of BKT LP first and push it into the hole (Fig. 1-3).

iii. Hook Clip LP to HSG DMD, and lock with screw well. (Fig. 1-4)

iv. Placed LP Module on LP datum of "DMD HSG" and adjustment screw well (Fig. 1-5).

v. Assembly "Baffle LP", Hook top of Baffle LP first (Fig. 4-10) & Hook bottom of Baffle LP to HSG DMD well (Fig.1-7).

1.2 Overfill Adjustment @ LP Module

Overfill Adjustment Criteria:

i. Pre-assembly 2 adjusting screws. Criteria shown as (Fig.1-4)

ii. Alignment Sequence:

A. To adjust "Horizontal Adjustment Screw" firstly, and then "Vertical Adjustment Screw".

B. Refer to (Fig. 1-4)

1.3 For Overfill Re-adjustment:

a. Those 2 Adjustment Screws must be released closely to the "Pre-assembly" positions first (Fig. 1-4)

b.Follow adjustment steps shown in Item 1.2-ii.

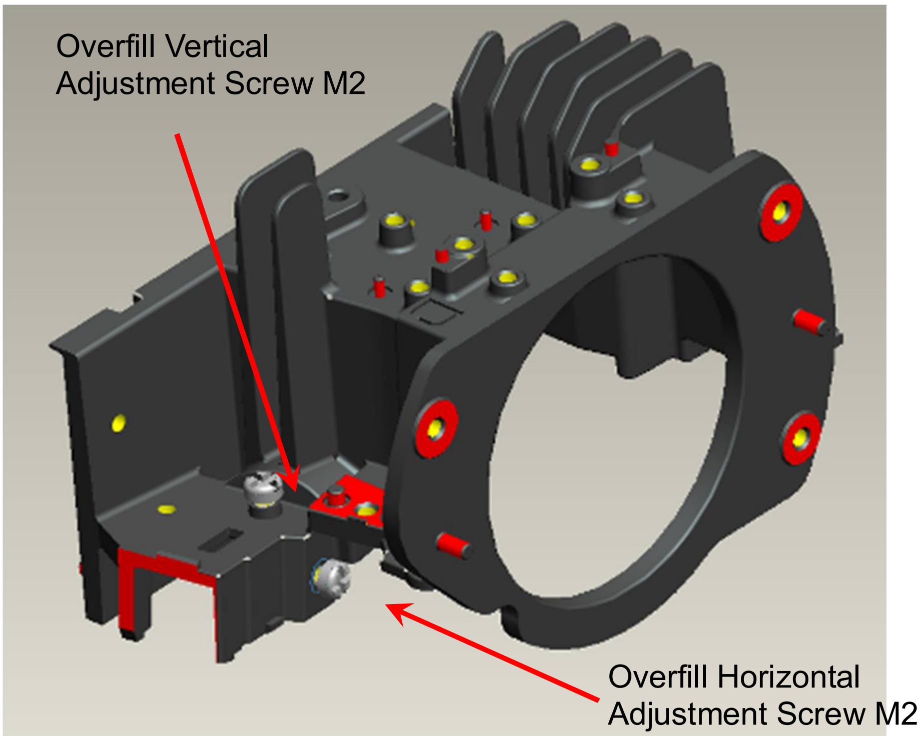


Fig. 1-1

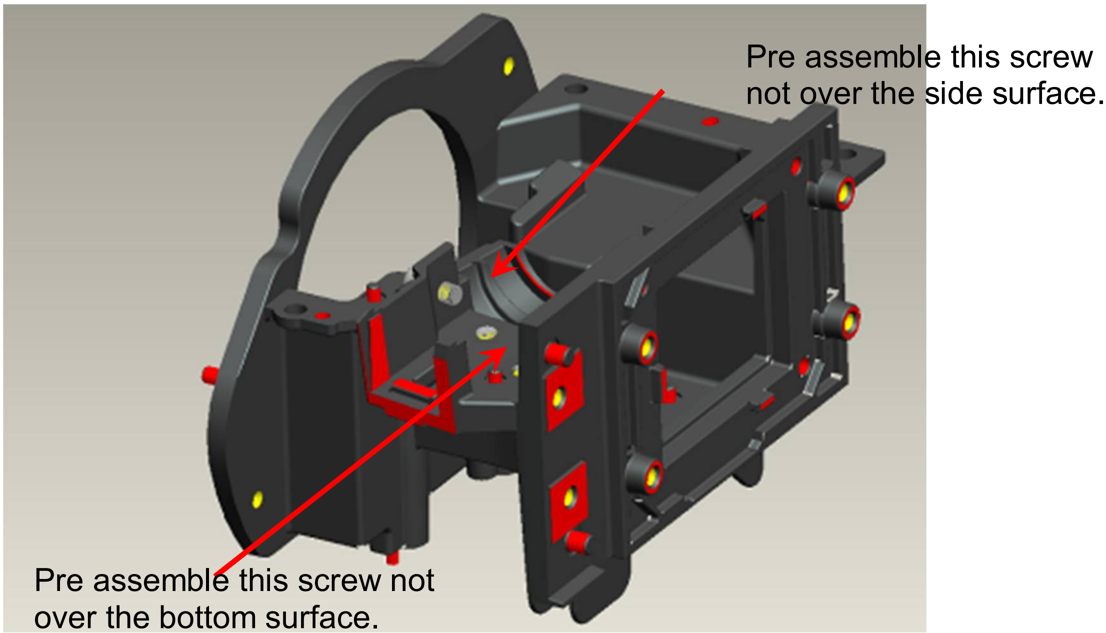


Fig. 1-2

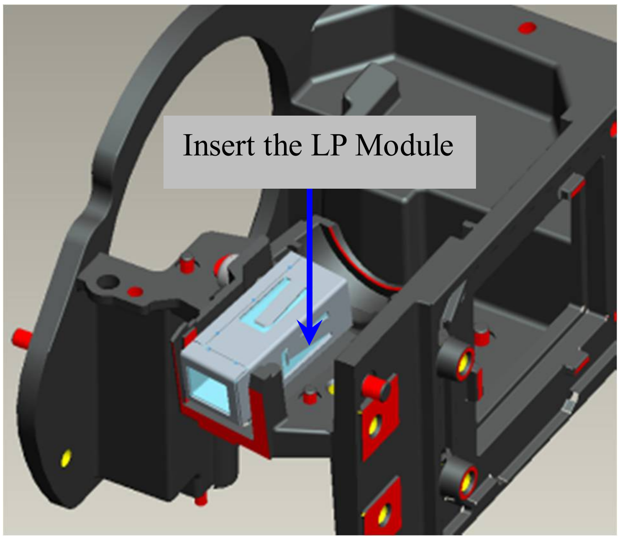


Fig. 1-3

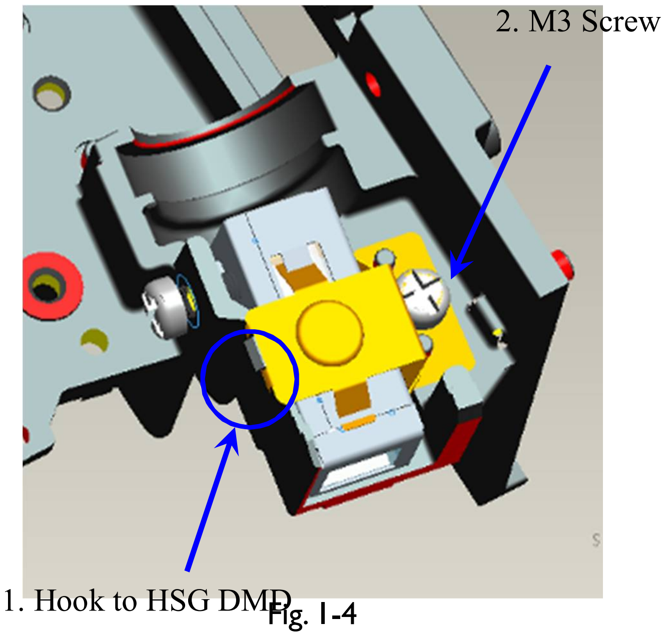


Fig. 1-4

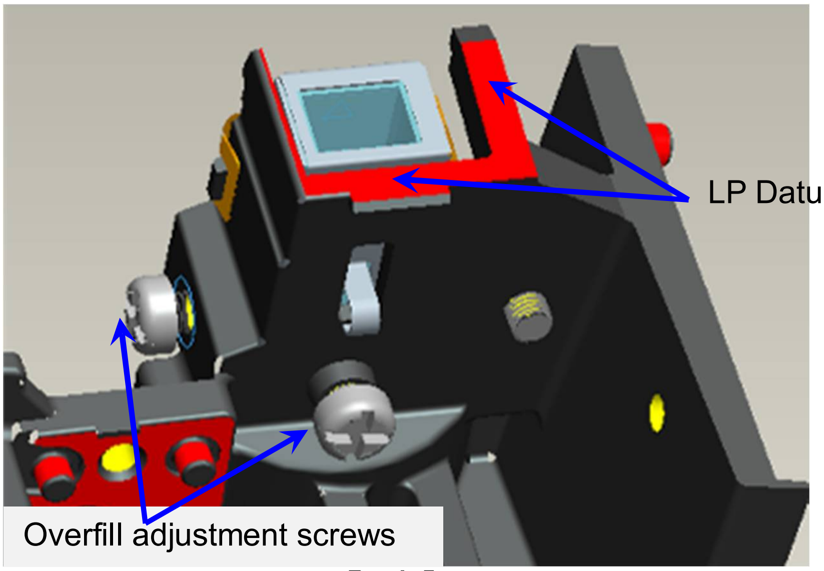


Fig. 1-5

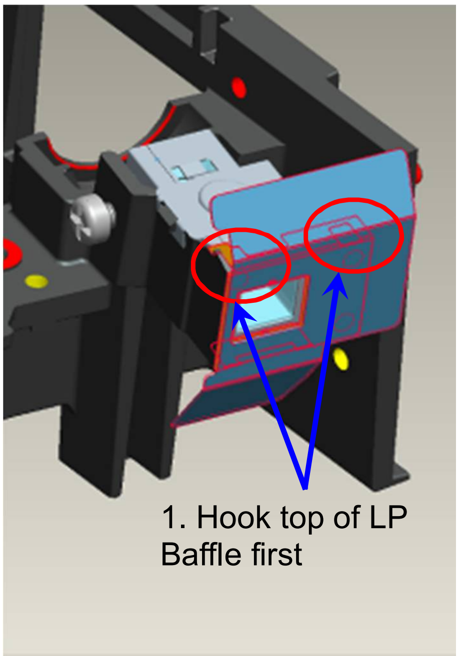


Fig. 1-6

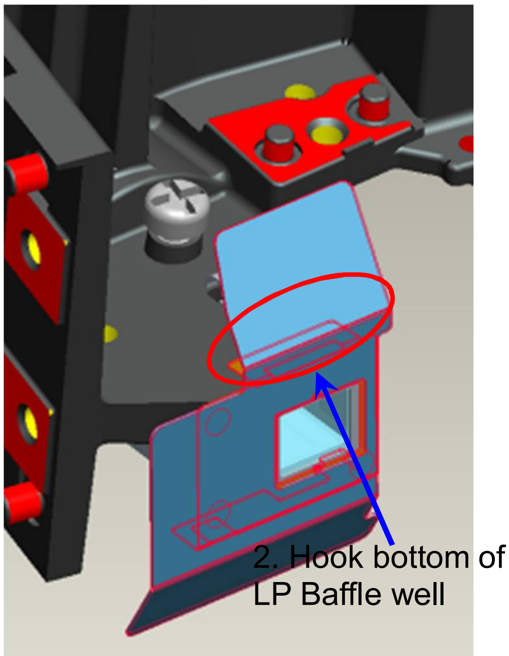


Fig. 1-7

2. Assembly SUB HSG MODULE:

2.1 SCM and FM Assembly

I. Hook "Cover SUB Clip Side" on SUB HSG. (Fig. 2-1 & 2-2)

II. Place SCM on SUB HSG SCM DTM and makes SCM touching DTM truly. (Fig. 2-3 & Fig. 2-4)

III. Assemble "Cover SUB Clip Down" on SUB HSG and lock with screw well. (Fig.2-5).

IV. Hook "Cover SUB Clip Up" on SUB HSG to fix SCM. (Fig. 2-6)

V. Check mark point of FM and place FM on SUB HSG FM DTM. (Fig. 2-7 & Fig. 2-8)

VI. Hook "Clip FM" on SUB HSG to fix FM. (Fig. 2-9)

VII. Assemble "Clip FM2" on SUB HSG and lock with screw well. (Fig. 2-10)

VIII. Paste " AL Sponge" on cannelure of SUB HSG (Fig. 2-11).

IX. Paste "Mylar Sub HSG" align the edge on outside of sub HSG. (Fig. 2-12)

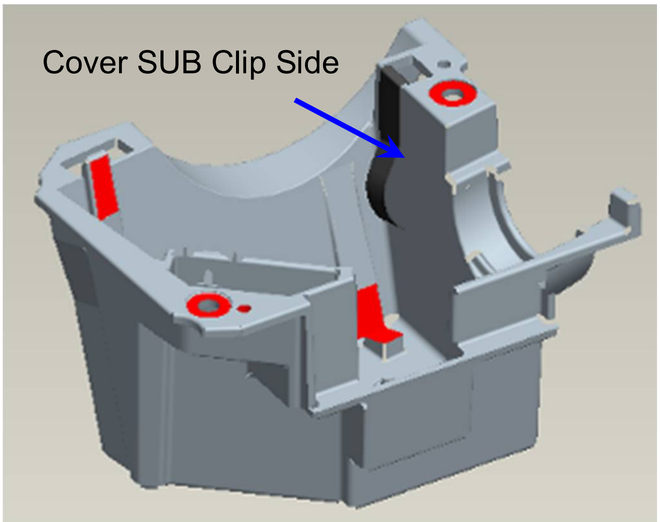


Fig. 5-1

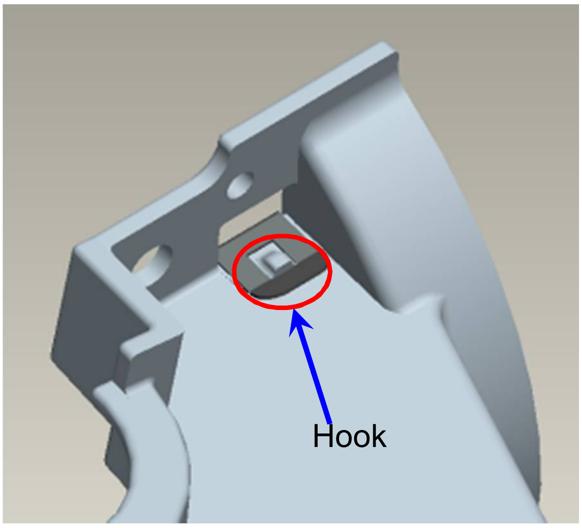


Fig. 5-2

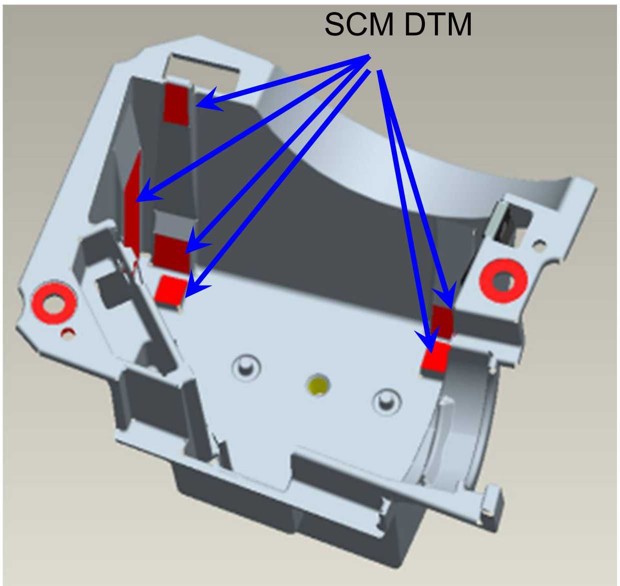


Fig. 2-3

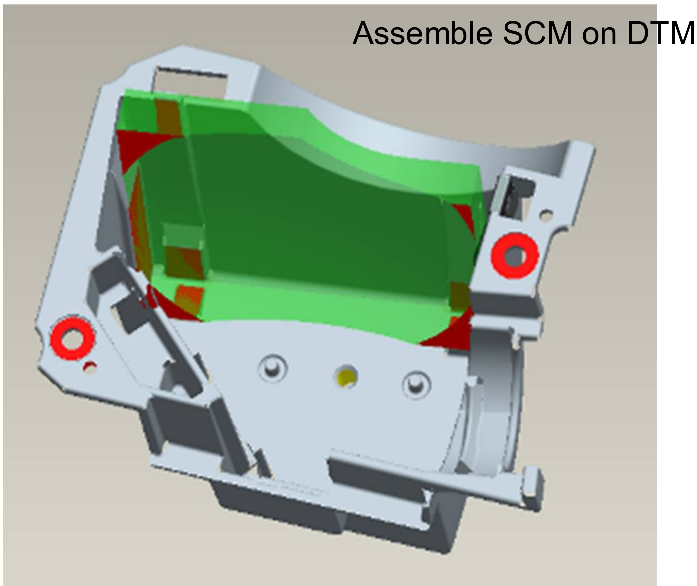


Fig. 2-4

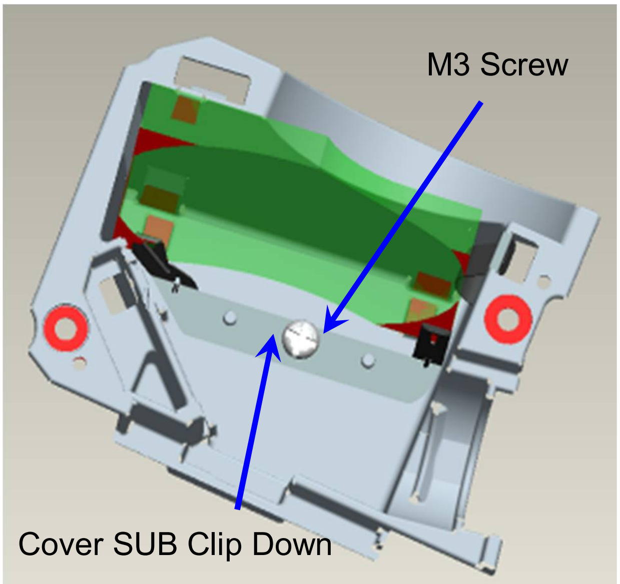


Fig. 2-5

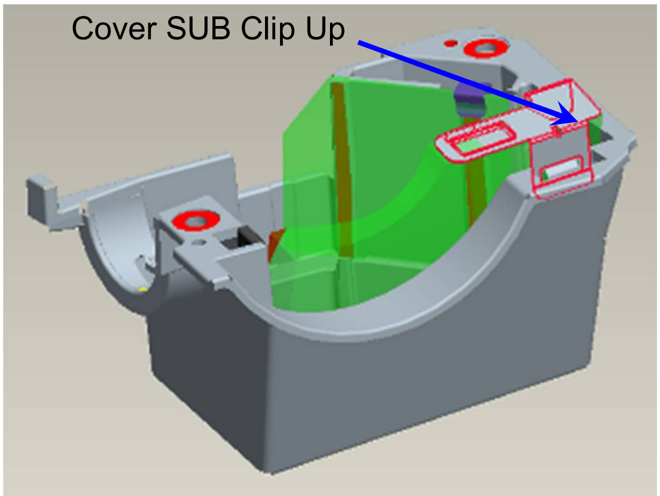


Fig. 2-6

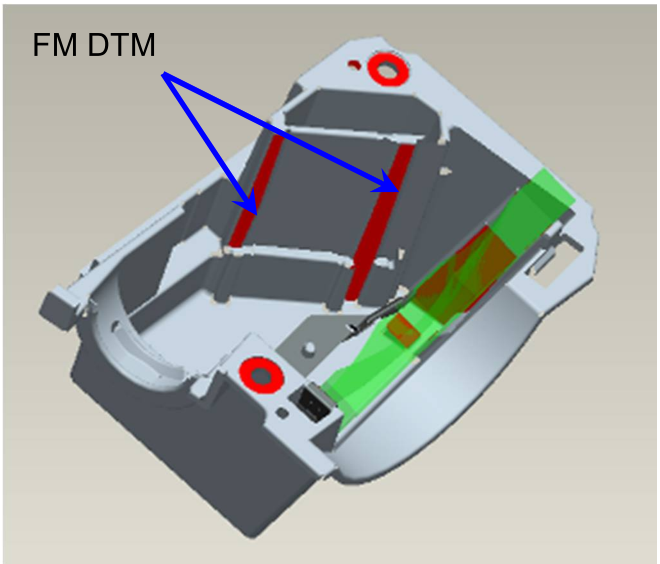


Fig. 2-7

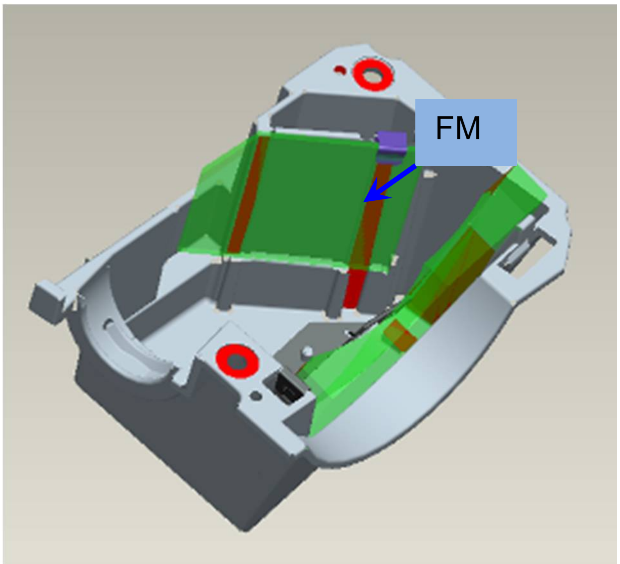


Fig. 2-8

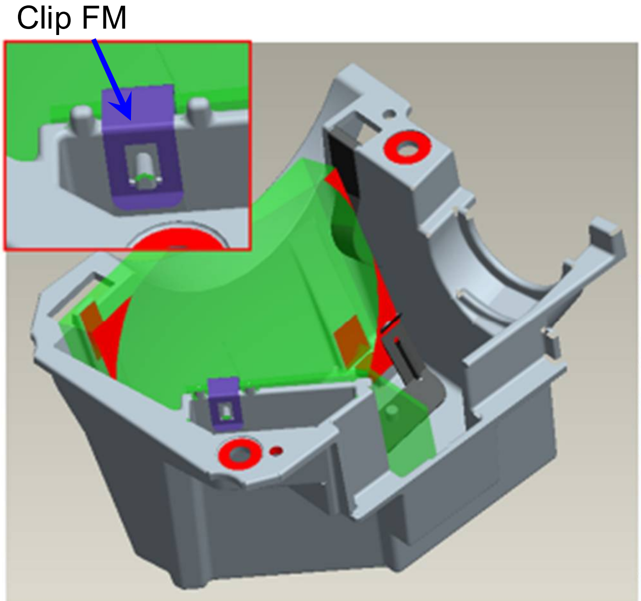


Fig. 2-9

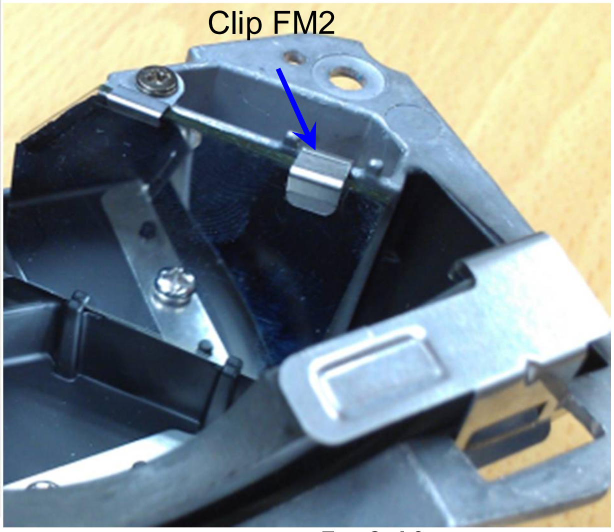


Fig. 2-10

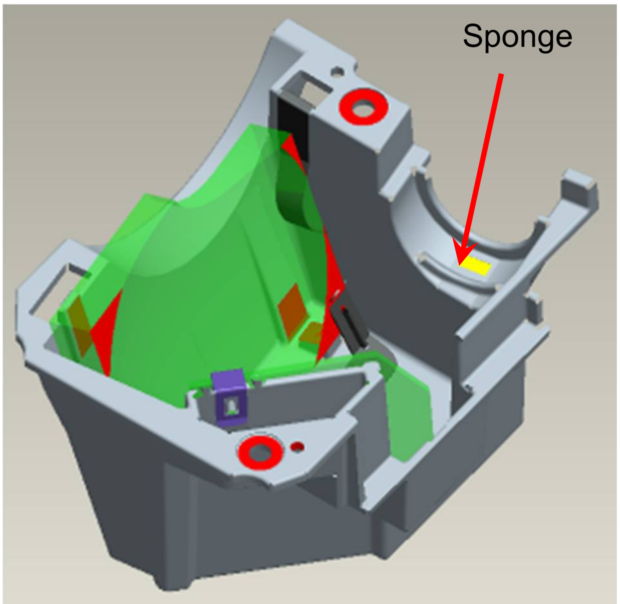


Fig. 2-11

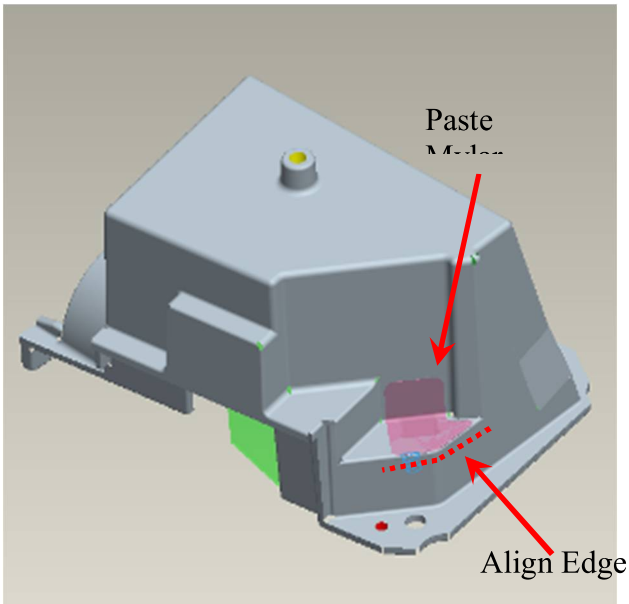


Fig. 2-12

3. AL and SUB HSG Assembly:

A. Placed "AL" on the "HSG DMD". The "raised surface" of "AL" shall toward "DMD direction" (Fig. 3-1)

B. Paste " Mylar " on DMD HSG. (Fig. 3-2-1)

C. To assemble "HSG ILL SUB Module" with "HSG DMD" and cover over on "AL" and the lock with screws (Fig.3-2-2).

D. Paste "SPONGE SUB HSG FRONT" on "HSG ILL SUB Module" outside of sub HSG. (Fig. 3-3)

E. Paste "SPONGE 45MM DUST" on "HSG ILL SUB Module" outside of sub HSG. (Fig. 3-4)

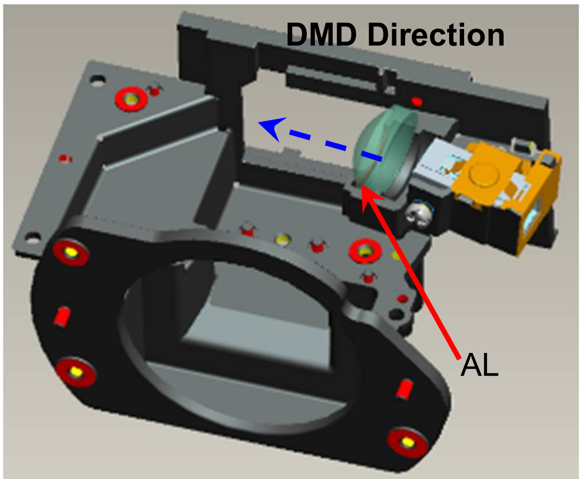


Fig. 3-1

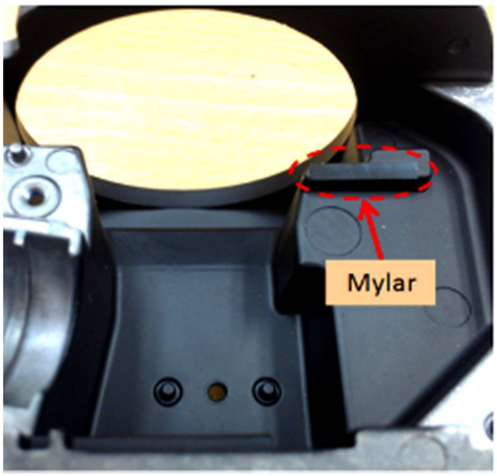


Fig. 3-2-1

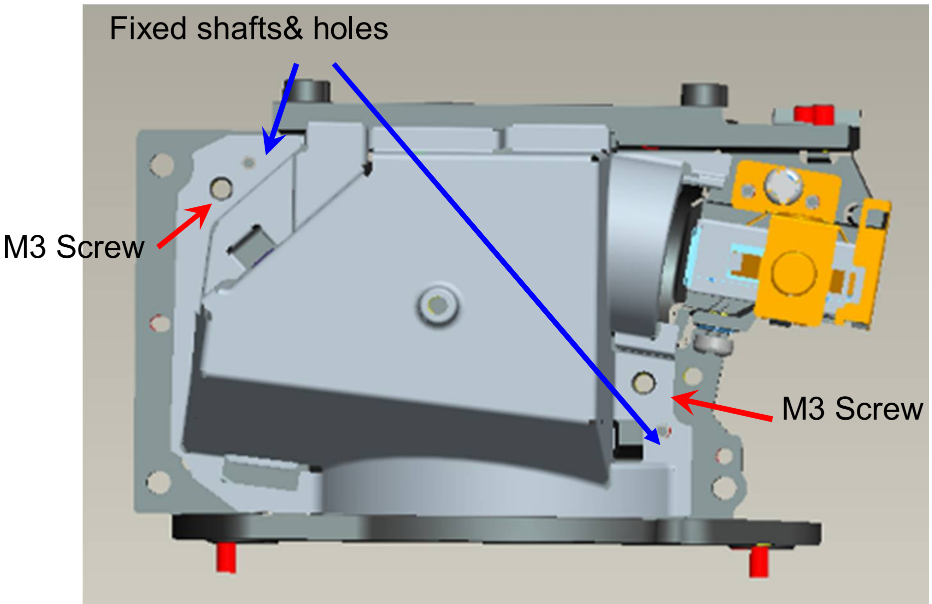


Fig. 3-2-2

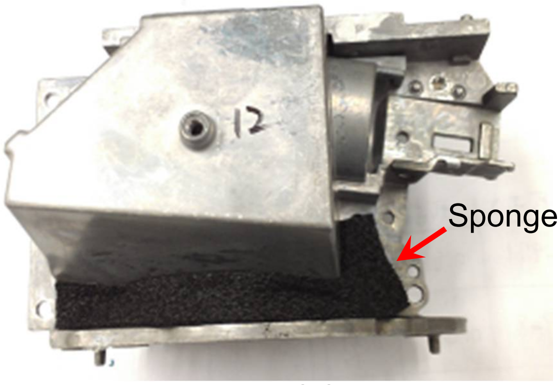


Fig. 3-3

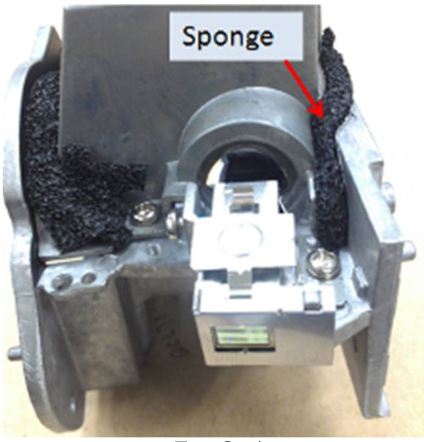


Fig. 3-4

4. DMD SOCKET Module:

A. Judge Socket and DMD alignment keying first. (Fig. 4-1 & Fig. 4-2)
B. Alight keying and Assemble DMD no Socket (Fig. 4-3).
C. Place "DMD sponge" on DMD (Fig. 4-4).

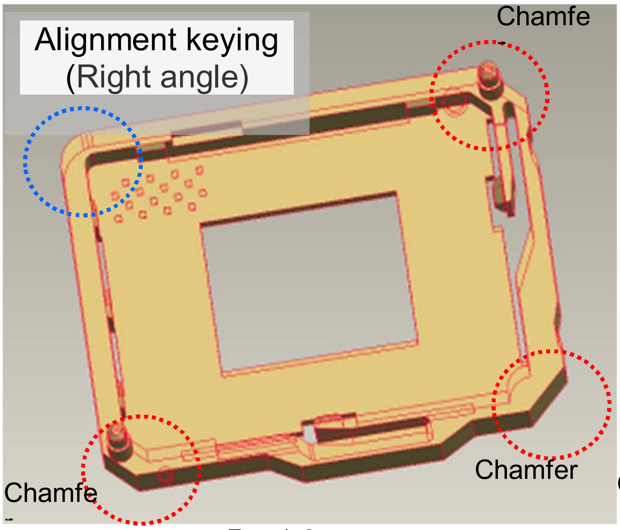


Fig. 4-1

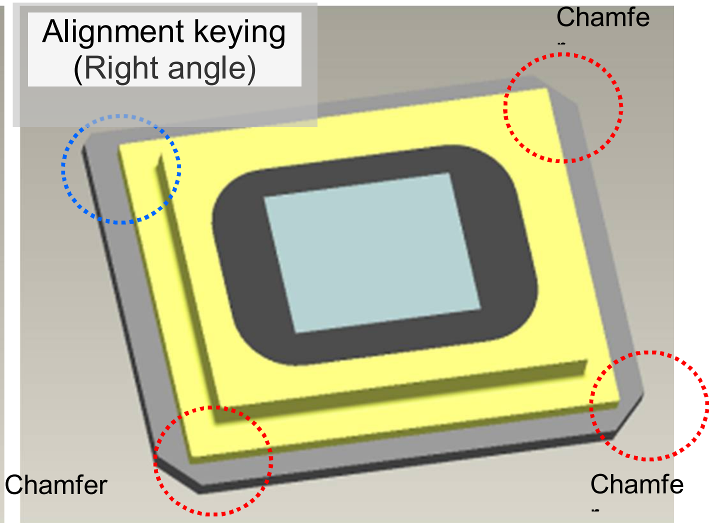


Fig. 4-2

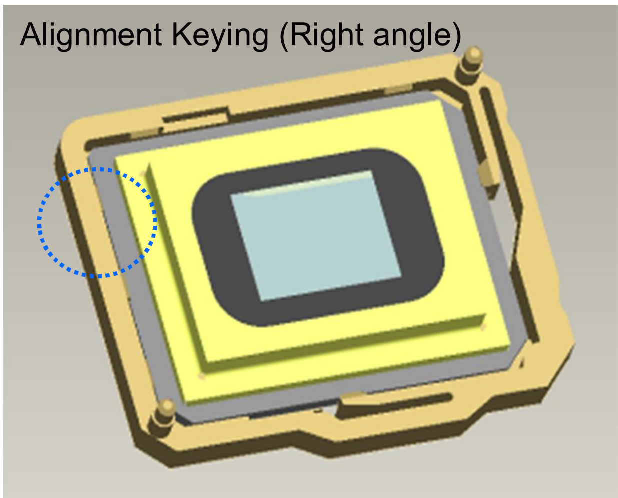


Fig.4-3

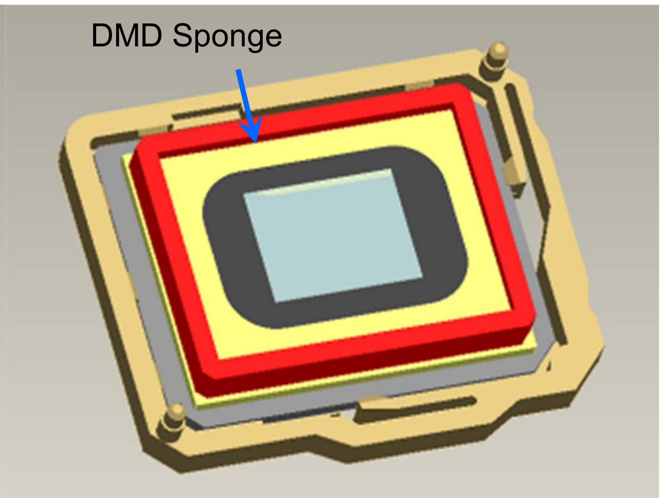


Fig. 4-4

5. Assembly Optical ENG

A. Assemble "Baffle DMD" to "HSG DMD" (Fig.5-1-1 & Fig.5-1-2).

B. Assemble Socket DMD Module to "HSG DMD" (Fig. 5-2, Fig.5-3).

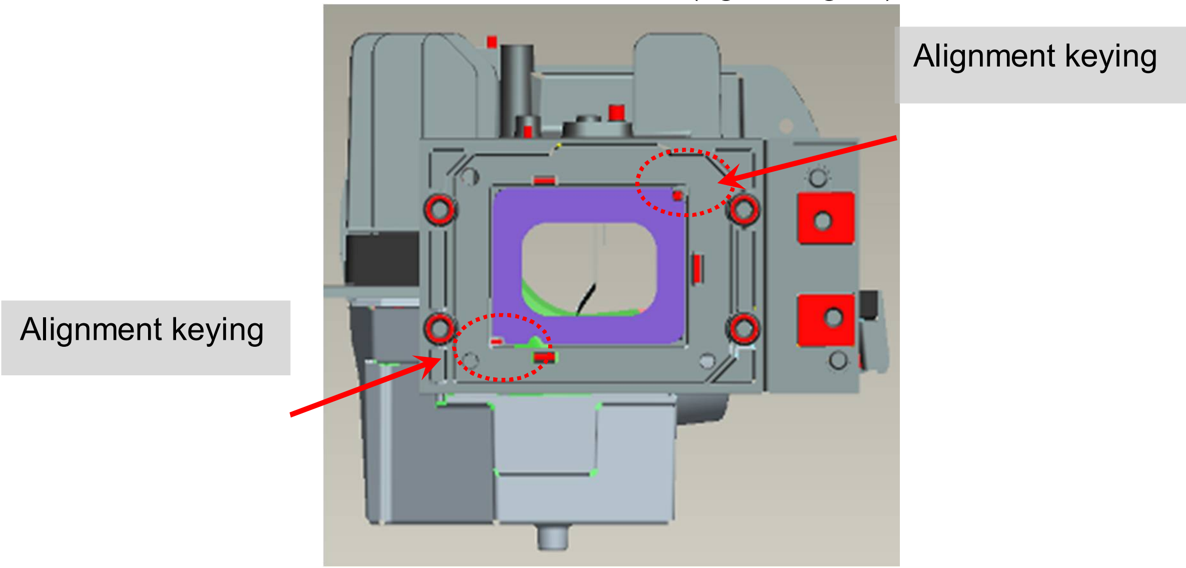


Fig. 5-1-1

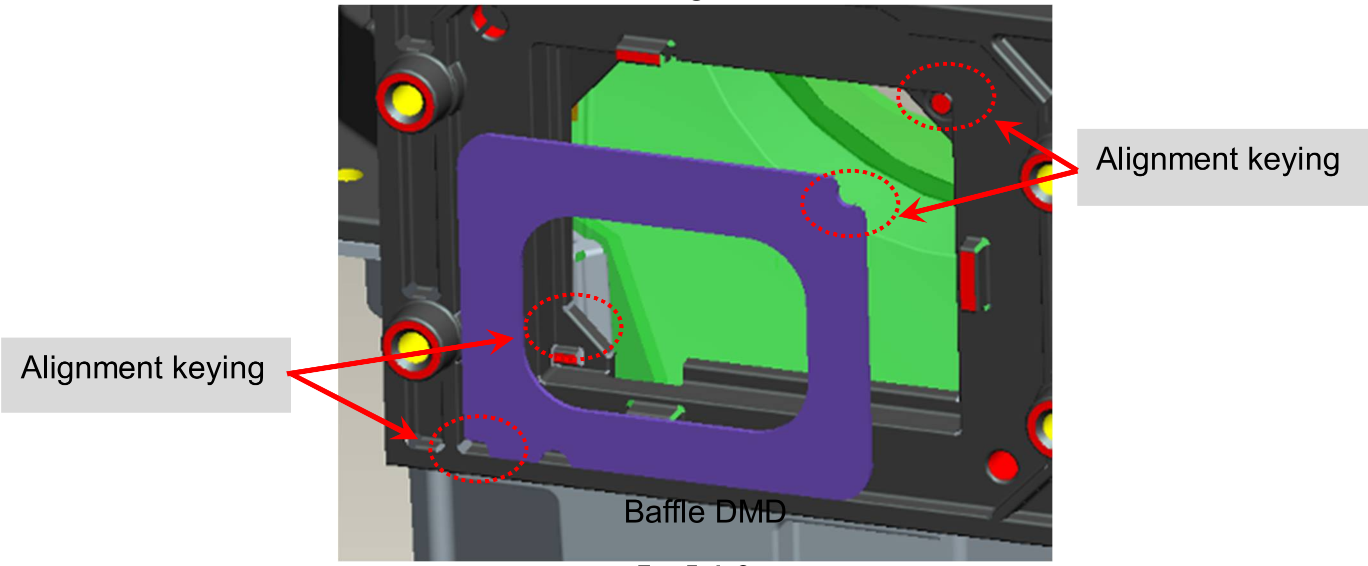


Fig. 5-1-2

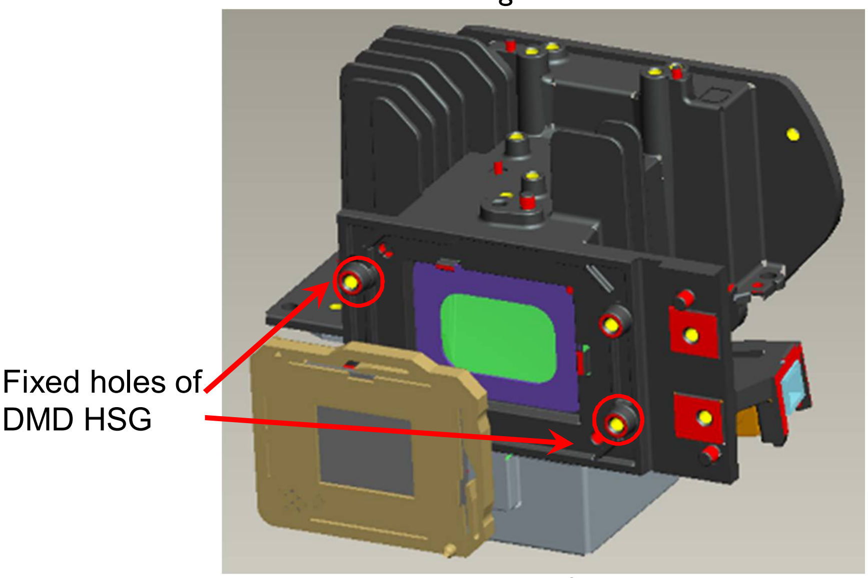


Fig. 5-2

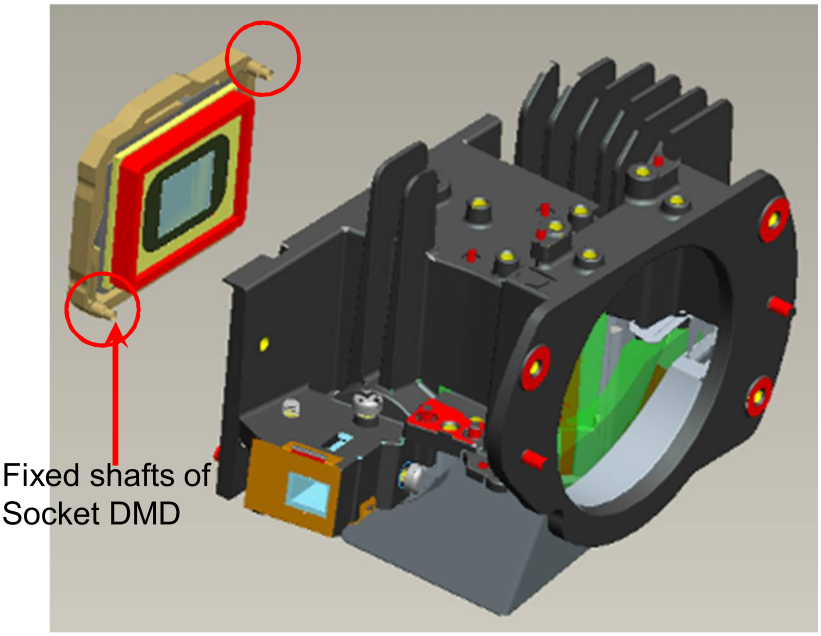


Fig. 5-3

C. Assemble Chip B/D & BACKER RUBBER (Fig. 5-4)

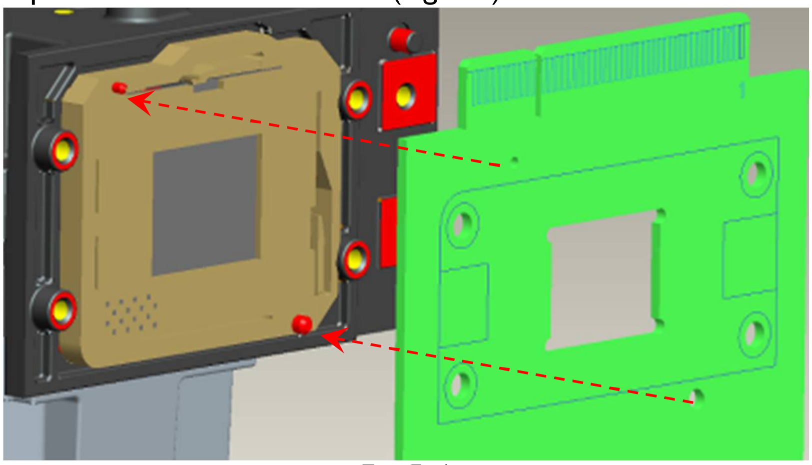


Fig. 5-4

D. Assemble & BACKER RUBBER (Fig. 5-5)

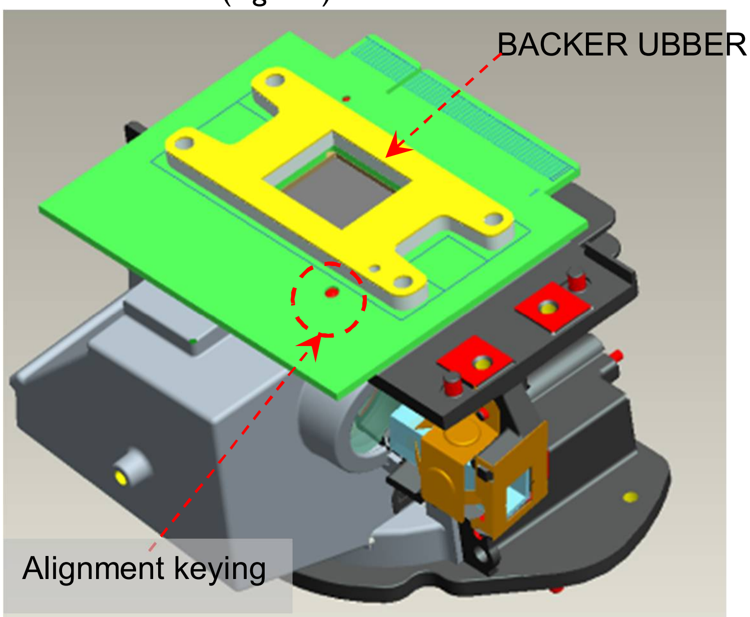


Fig. 5-5

E. Assemble Heatsink place contact DMD (Fig. 5-6).

1.>Press center of Heatsink before assemble spring screw then keeps press until spring screw assembly finish.

2.>Pre-fastening Sequence: [1] - [2] - [3] - [4] (Fig. 5-7).

3.>Fastening Sequence: [1] - [2] - [3] - [4] (Fig. 5-7).

4.>Screw Torque must be confirmed to be 6 kg-cm.

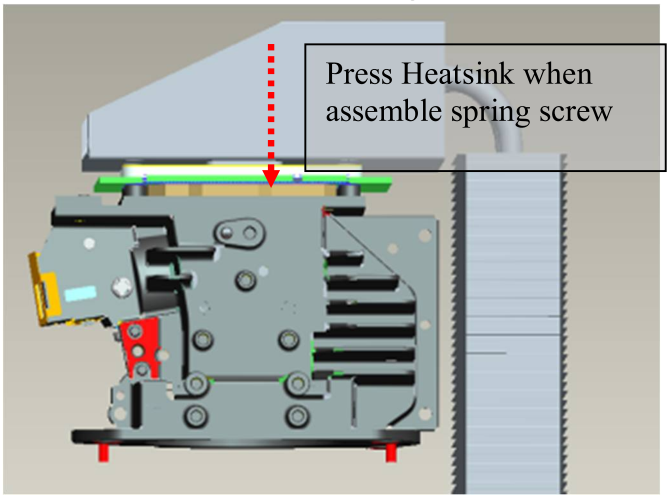


Fig. 5-6

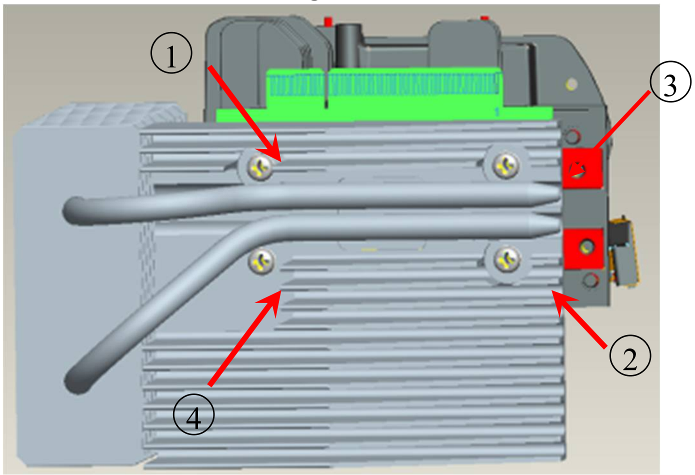


Fig. 5-7

F. Assemble "CW Module" to "DMD HSG" and lock with screws well (Fig. 5-8).

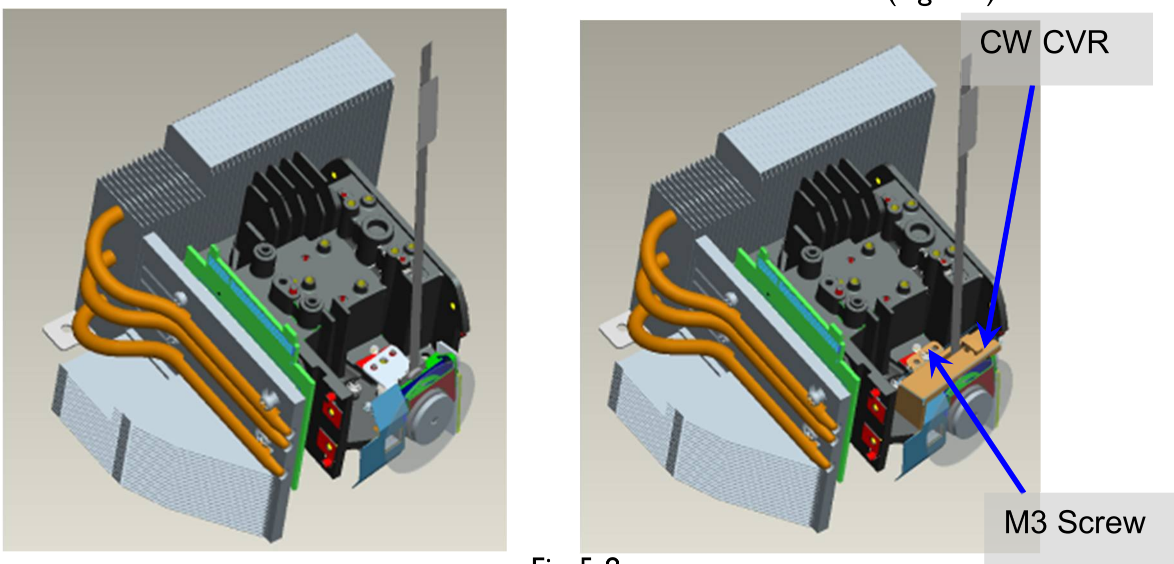
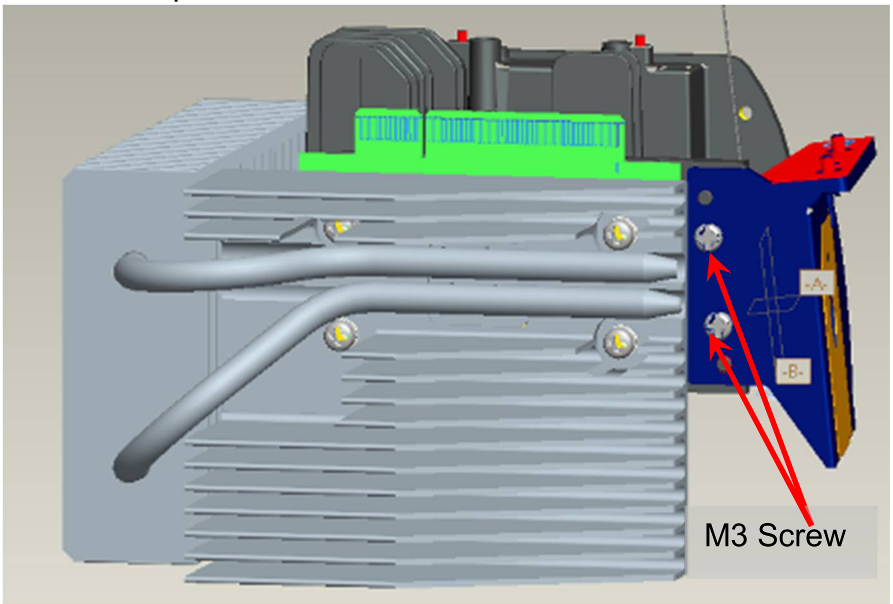


Fig. 5-8

G. Assemble "BKT Link Lamp & CW shield" on "DMD HSG" and then screws well (Fig.5-9).



6. Assembly Lens Shift

A. Use Grease smear on "HOLDER_LENS_SHIFT". (Fig.6-1)

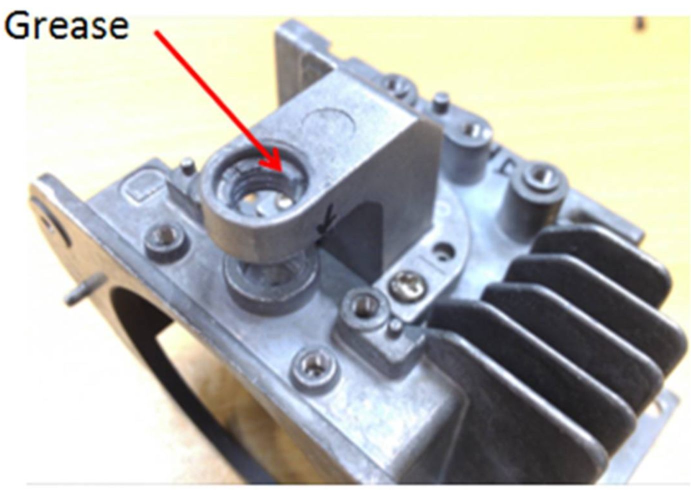


Fig.6-1

B. Assemble "HOLDER_LENS_SHIFT" and lock with screws well. (Fig. 6-2)

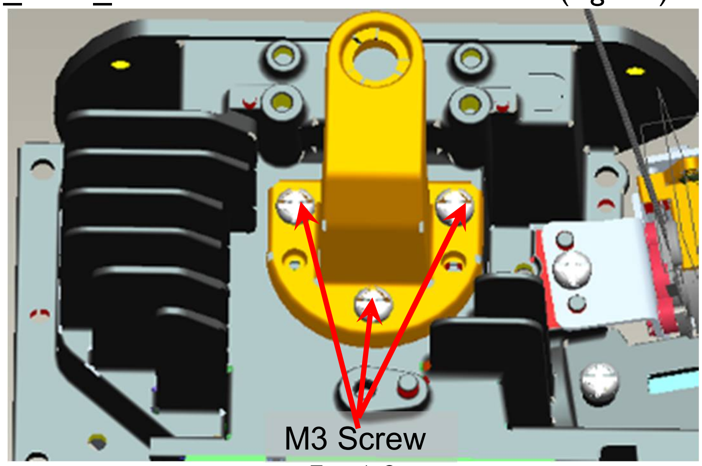


Fig. 6-2

C. Use Grease smear on “HOLDER ADAPTER”. (Fig.6-3)

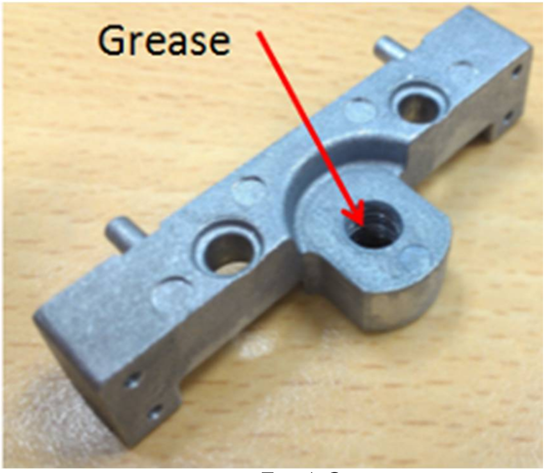


Fig.6-3

D. Use Grease smear on “HOLDER ADAPTER” . (Fig. 6-4)

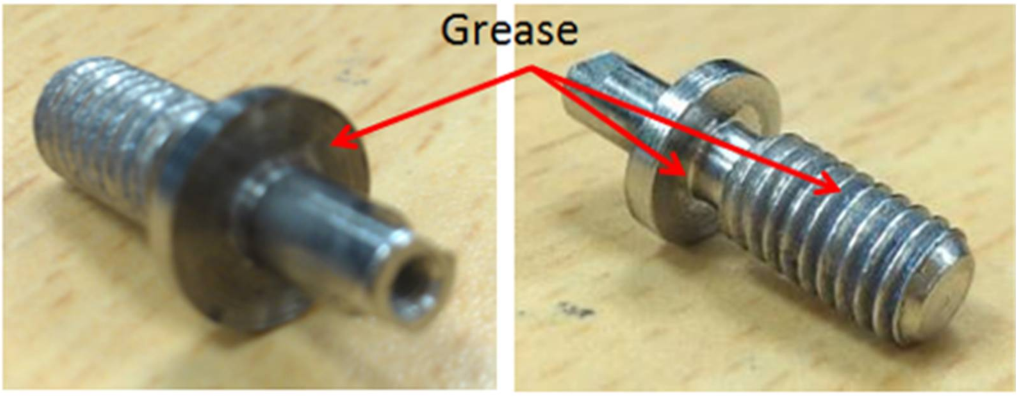


Fig.6-4

E. Assemble “HOLDER ADAPTER” by “SHAFT” screw. (Fig. 6-5)

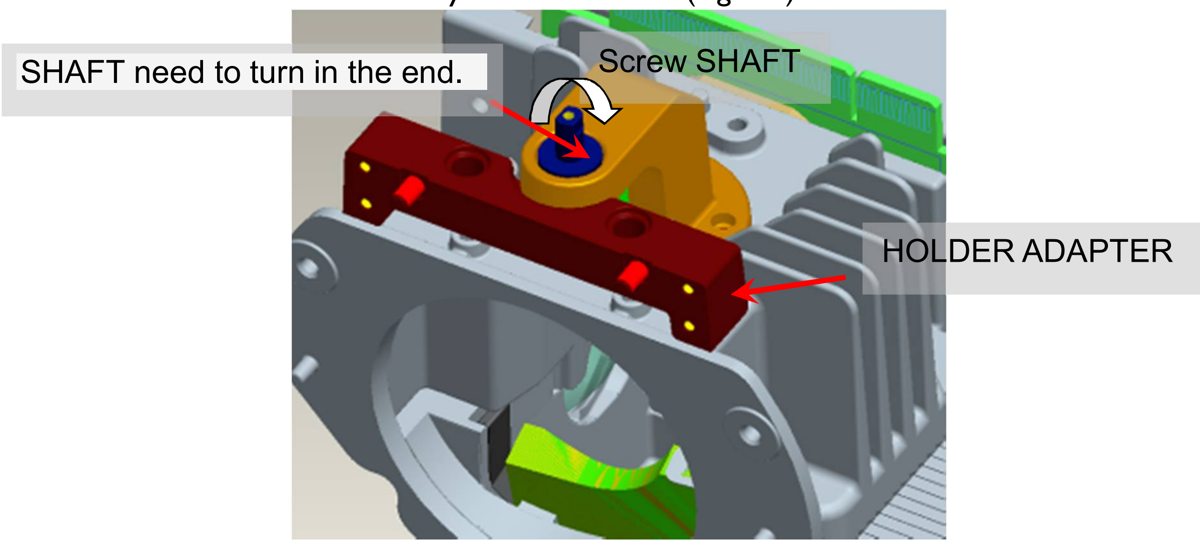


Fig. 6-5

F. Use Grease smear on “PLATE LENS SHIFT” (Fig.6-6)

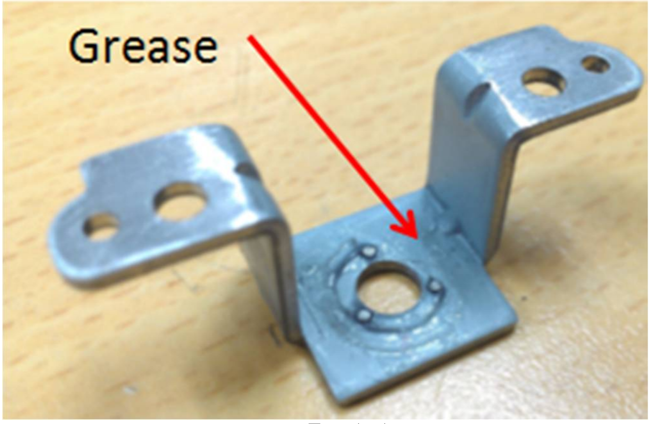


Fig.6-6

G. Assemble "LENS SHIFT PLATE" and screw Well. (Fig. 6-7)

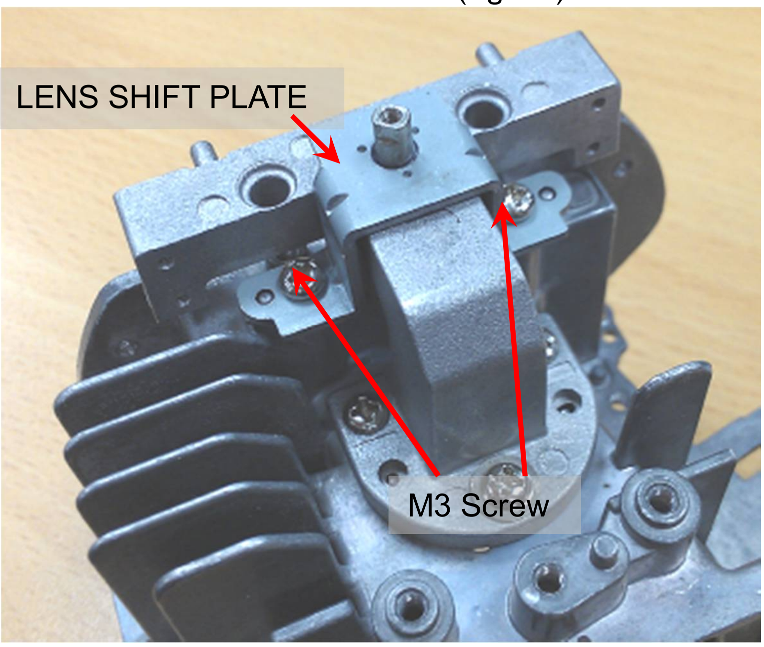


Fig. 6-7

7. Assembly Lens

A. Assemble "Lens" and lock with screws well

i. Assemble Lens and the Assembly direction must be horizontal，and do not impact CM. (Fig. 7-1)

ii. Pre-fastening Spring Screws firstly. Screw Torque must be confirmed to be 1-2 kg-cm. (Fig. 7-2)

iii. Fastening the Spring Screws well. Screw Torque must be confirmed to be 6.0-7.0 kg-cm. (Fig. 7-2)

iv. Fastening the M2 Screws well with "HOLDER ADAPTER" .

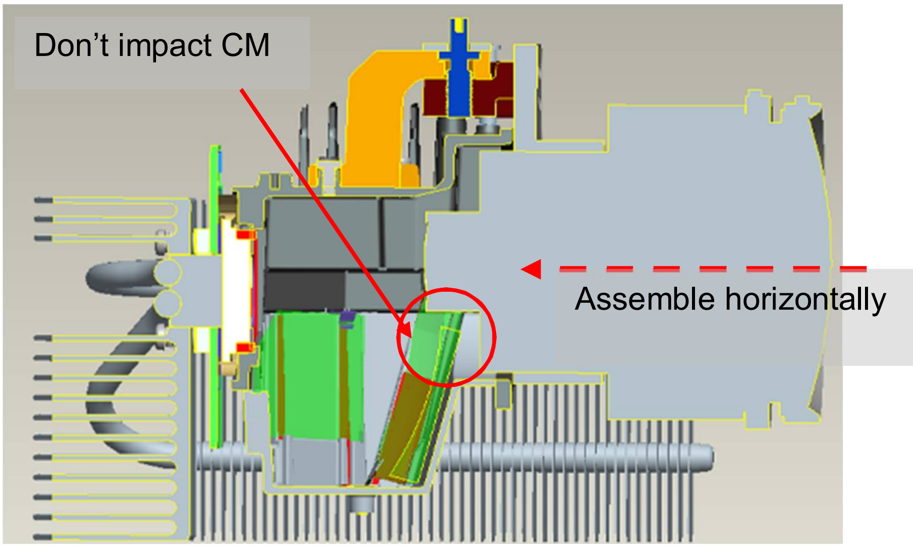


Fig. 7-1

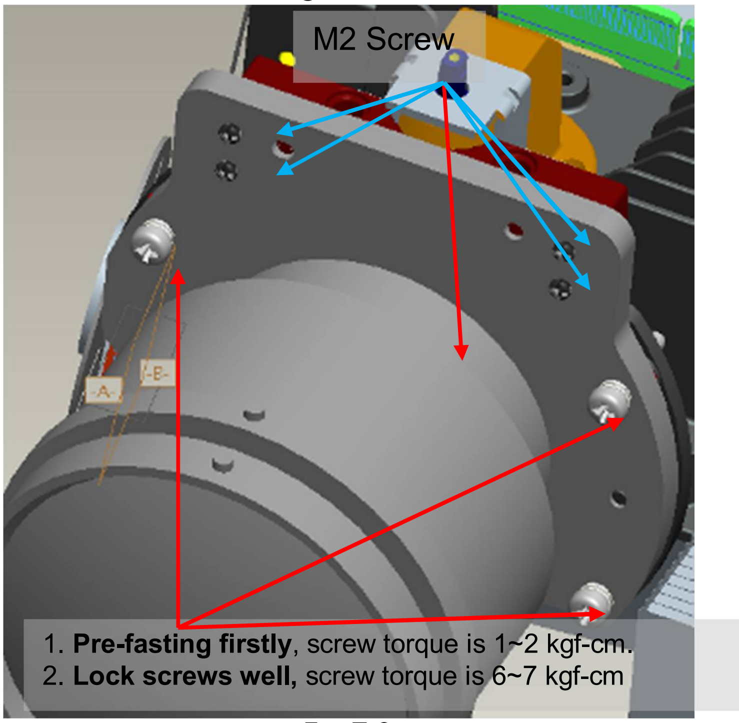


Fig. 7-2

B. Assemble Lamp Module to "BKT Link Lamp" and then lock with screw well (Fig. 7-3).

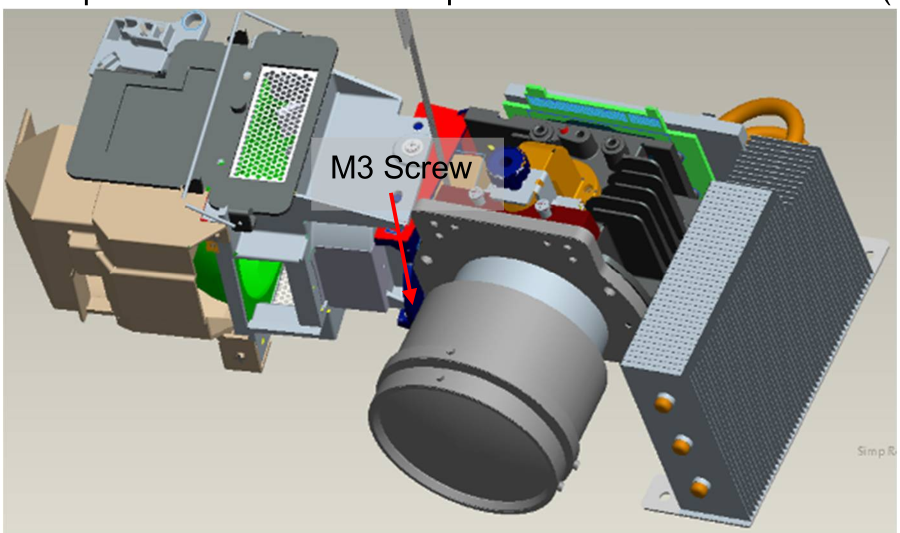


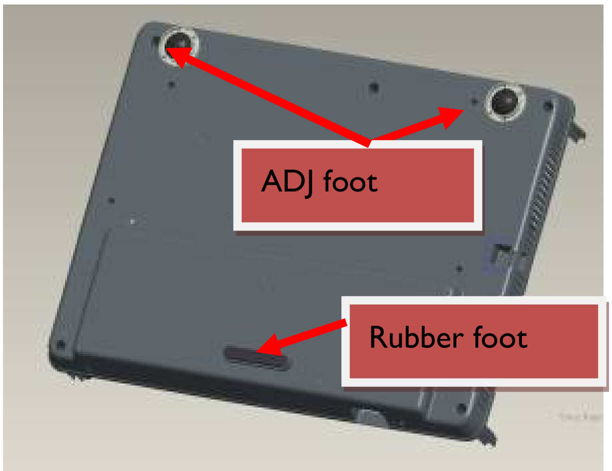
Fig. 7-3

5.4 Module Assembly Key Point - Mechanical

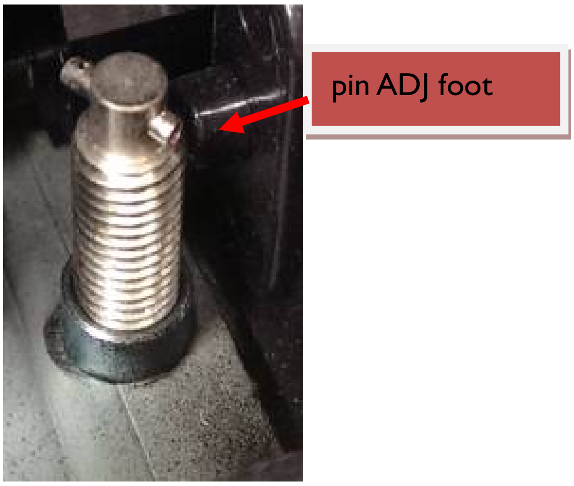
Mechanical Assembly Concerns

1. Lower Case module

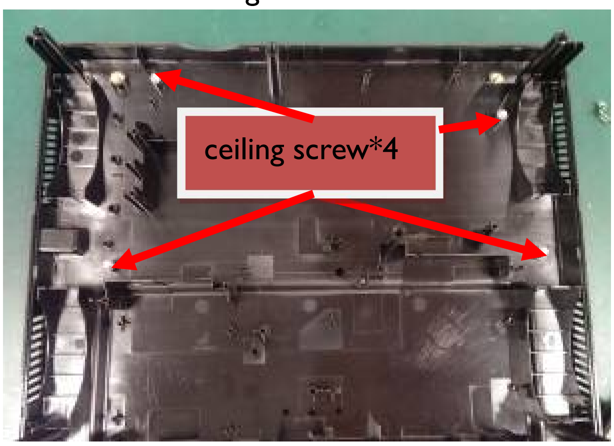
1-1 Assemble ADJ foot & Rubber foot on lower case

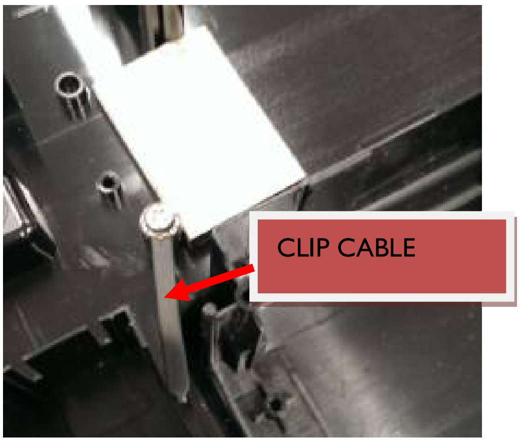


1-2 insert pin ADJ foot in the ADJ foot front

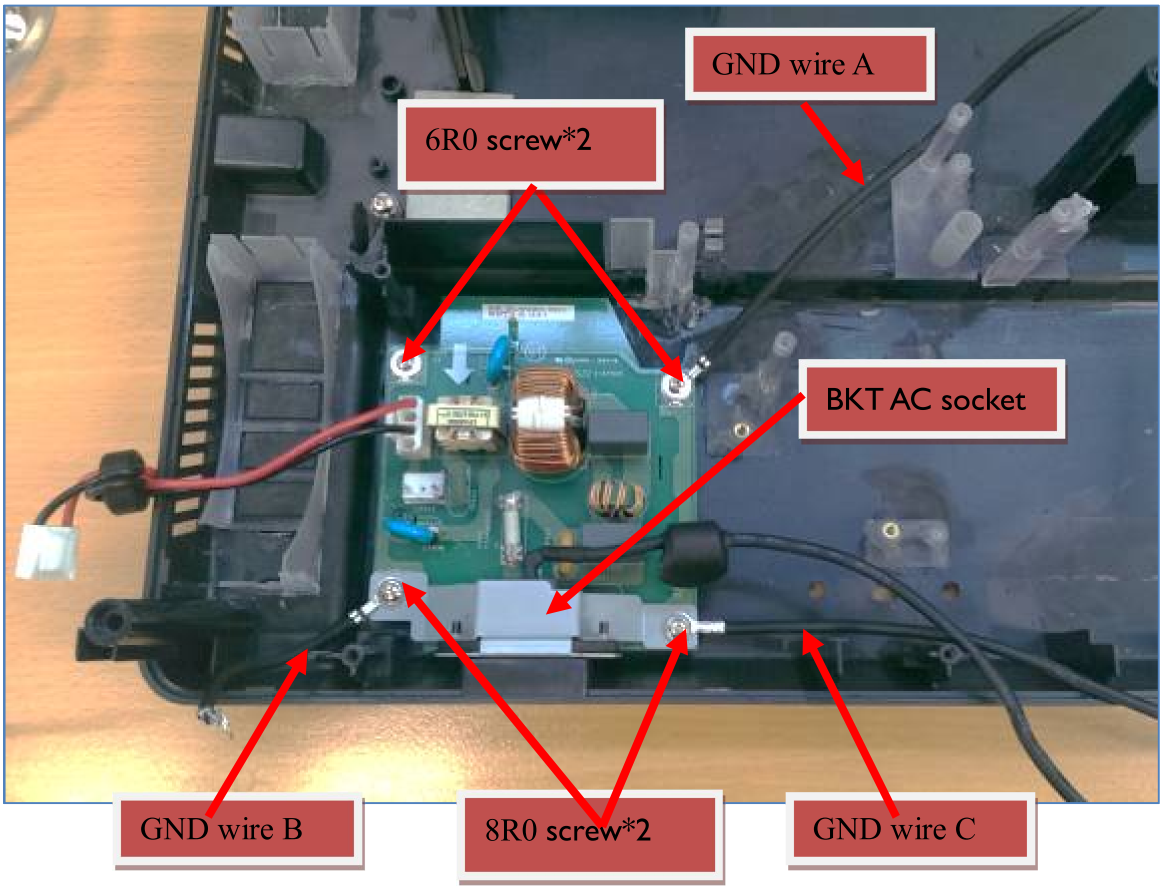


1-3 assemble ceiling screw

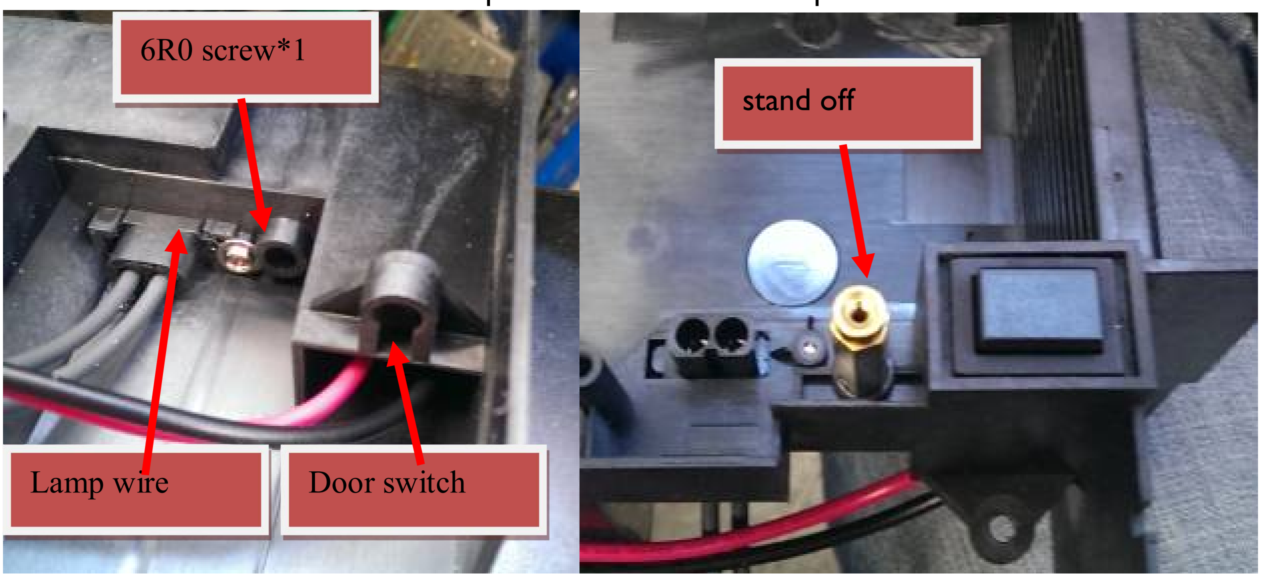




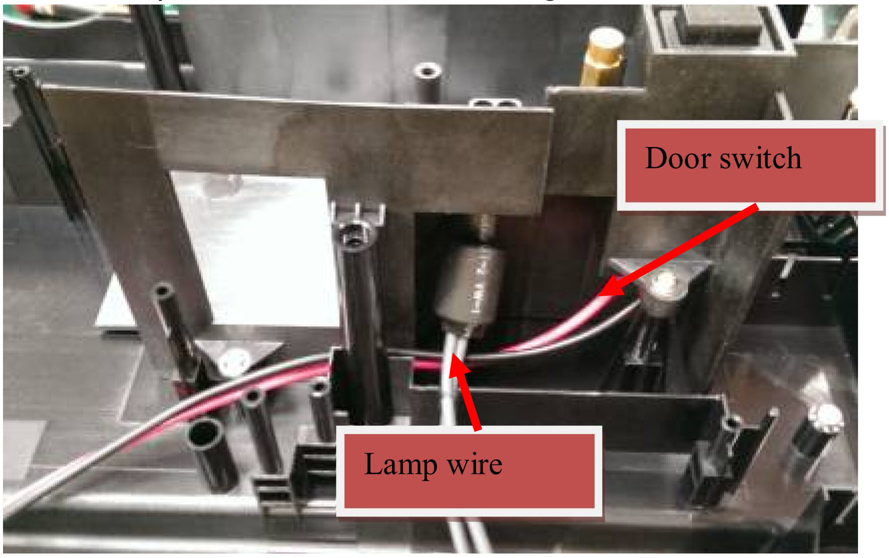
1. **Assemble EMI BD onto lower case**
   2-1. assemble BKT AC socket onto EMI BD by 2 screw.
   2-2. Assemble EMI BD onto lower case
   2-3. Assemble 3 grounding wire with EMI BD, please notice the direction of each wire.
   GND wire A: 140mm
   GND wire B: 65mm
   GND wire C: 285mm
   2-4. Assemble wire EMI BD to PWR



2. **Assemble lamp box onto lower case**
   3-1 assemble wire door switch & lamp wire & stand off on lamp box



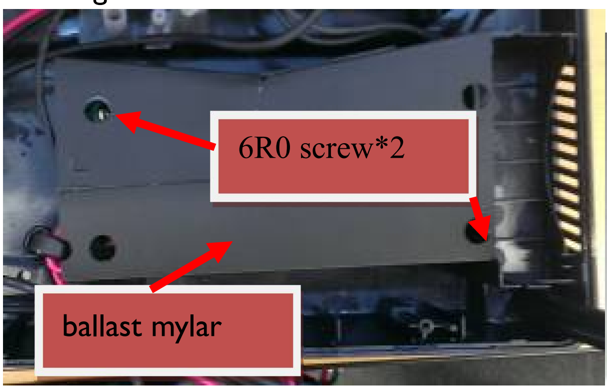
3-2 assemble lamp box onto lower case with 4 screw (8F.VG564.8R0), and plug the door switch on EMI BD, please notice the wire dressing.

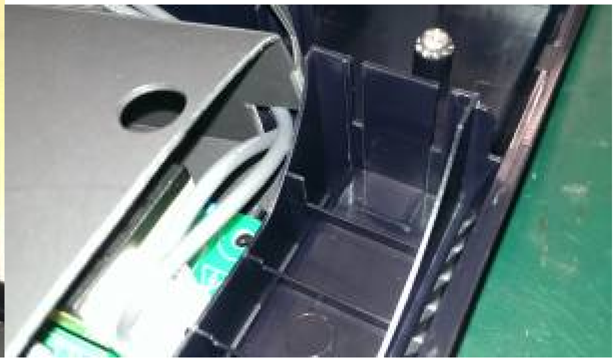


3. Assemble Ballast BD

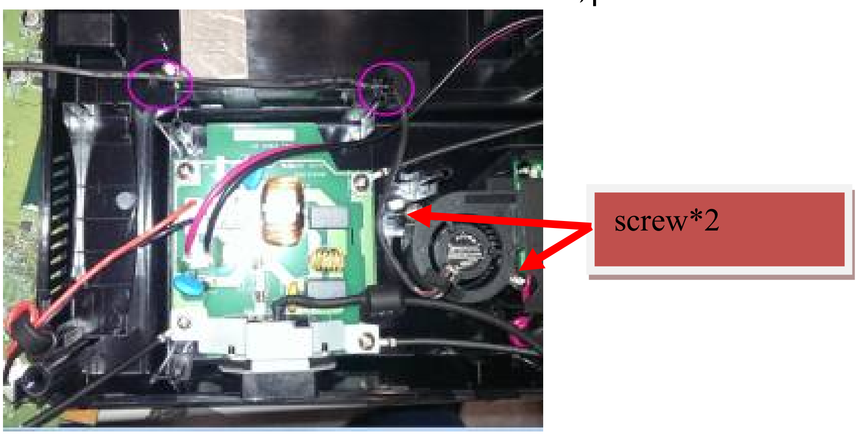
4-1 plug wire ballast to main BD, wire ballast to PWR, & lamp wire on ballast

4-2insert ballast mylar on ballast BD and assemble ballast BD on lower case, please notice the wire dressing.

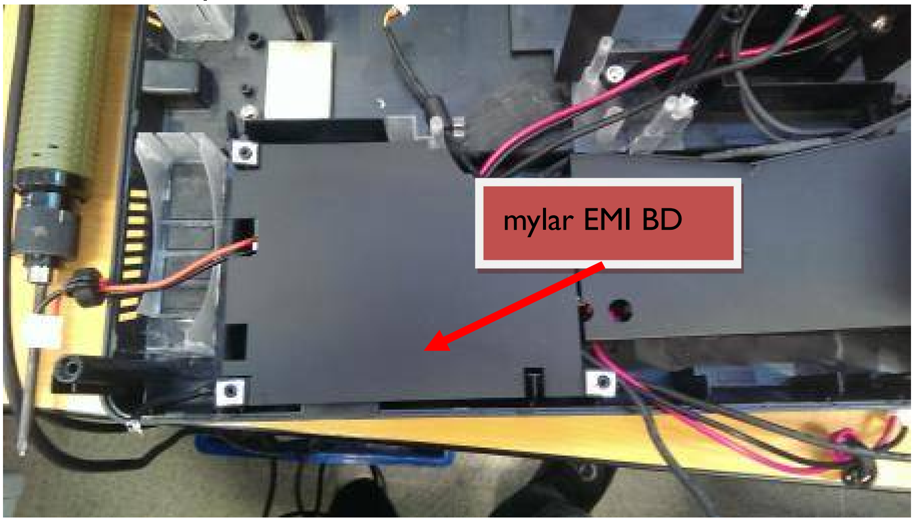




4-3 assemble ballast blower onto lower case, please notice the wire dressing

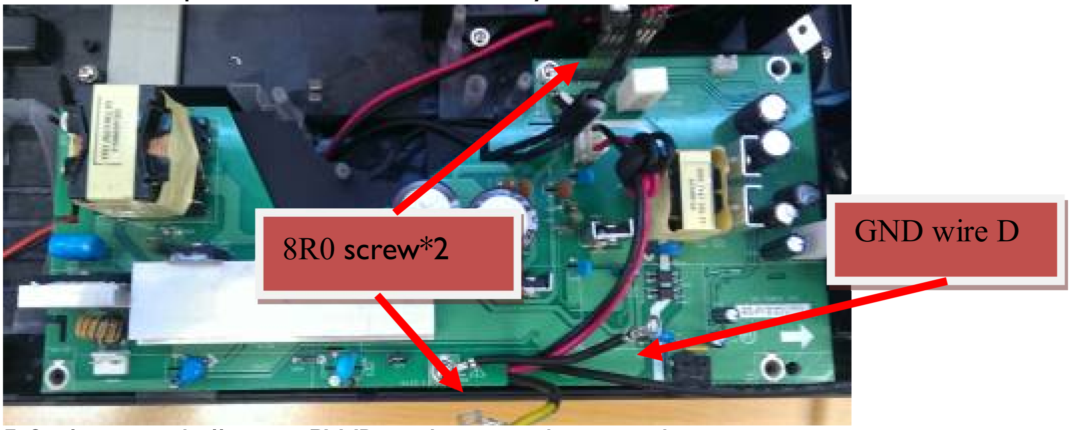


4-4 assemble mylar EMI BD on lower case.

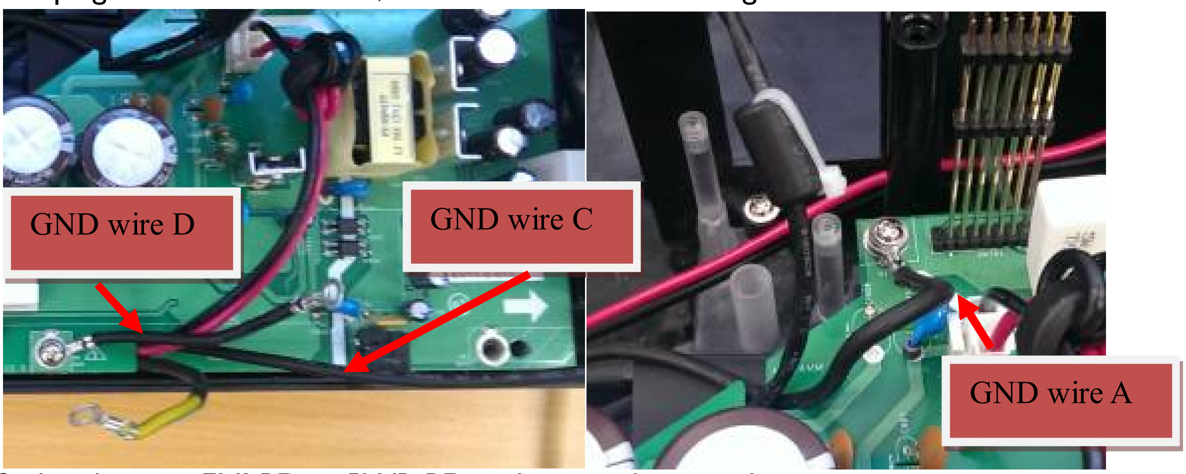


4. **Assemble power BD on lower case**

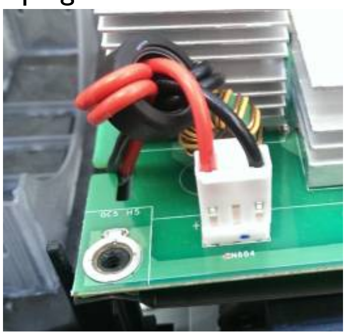
5-1 Assemble power BD on lower case by screw



5-2 plug wire ballast to PWR, and notice the wire dressing

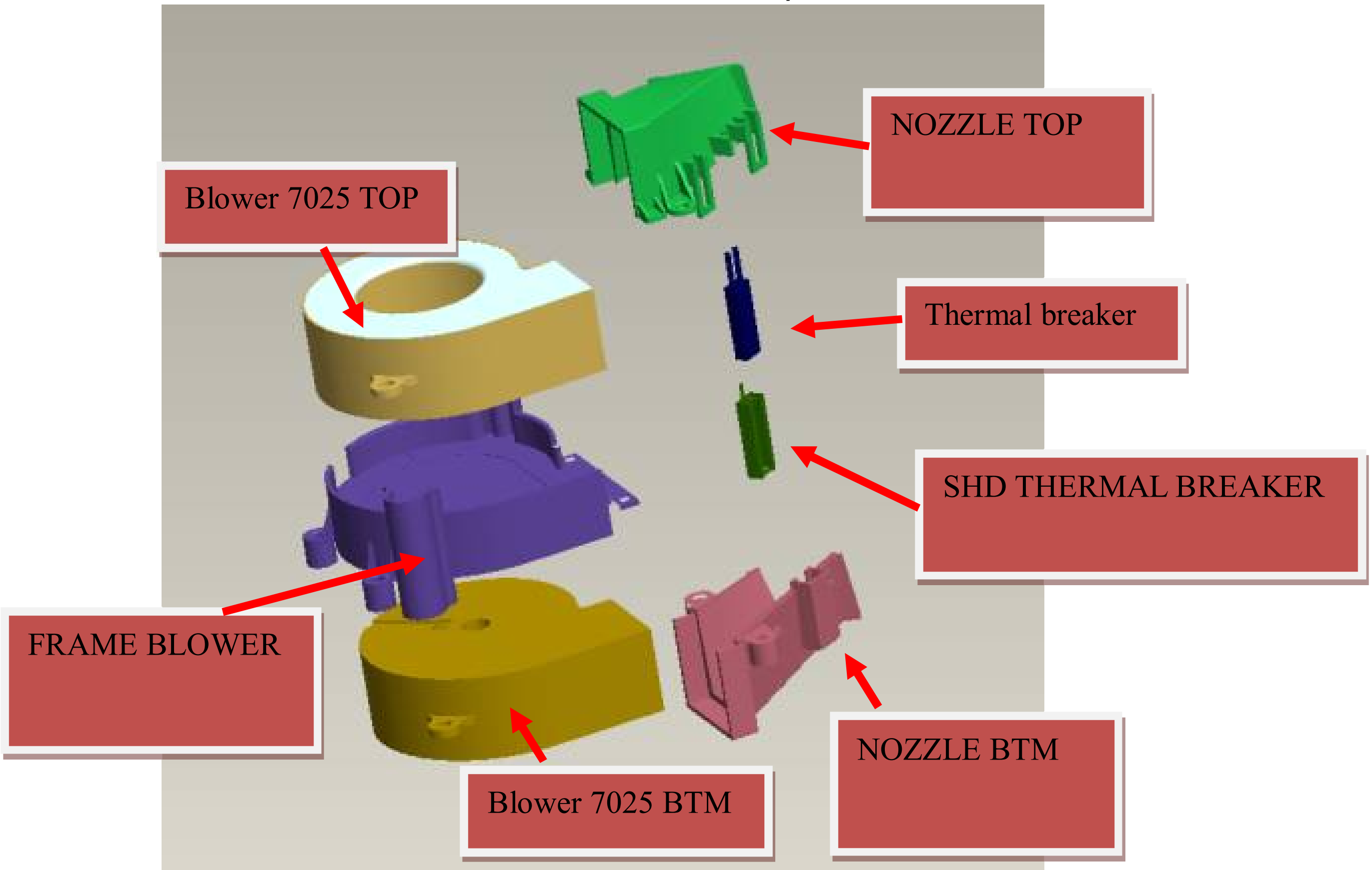


5-3 plug the wire EMI BD to PWR BD, and notice the wire dressing

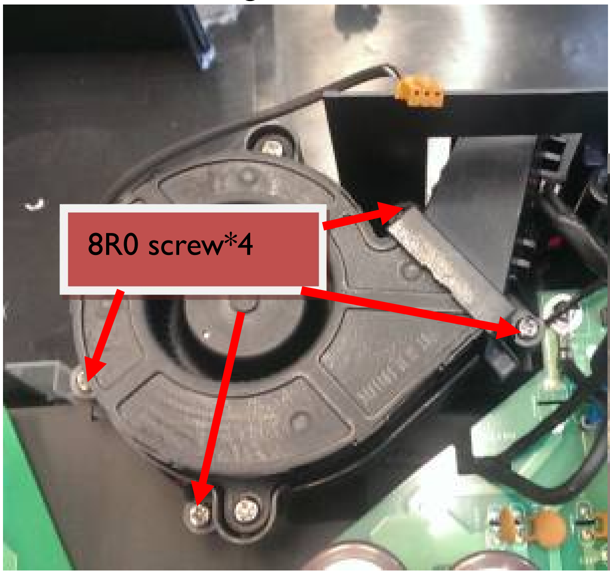


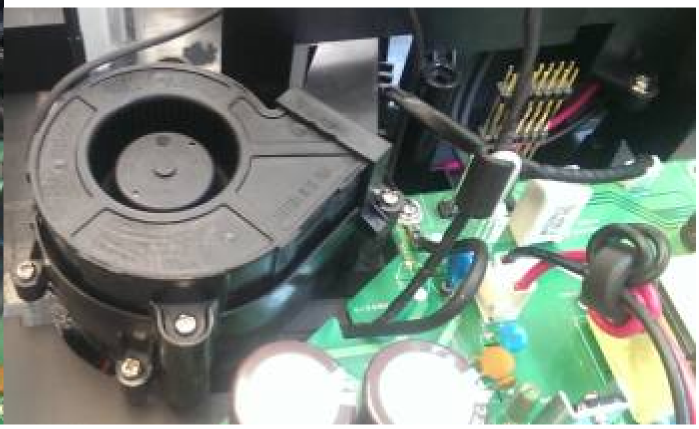
5. **Assemble the lamp blower module on lower case**

6-1 assemble the blower module, blower fixed by 8R0 screw.



6-2 Assemble the lamp blower module on lower case, and plug the thermal breaker, please notice the wire dressing.

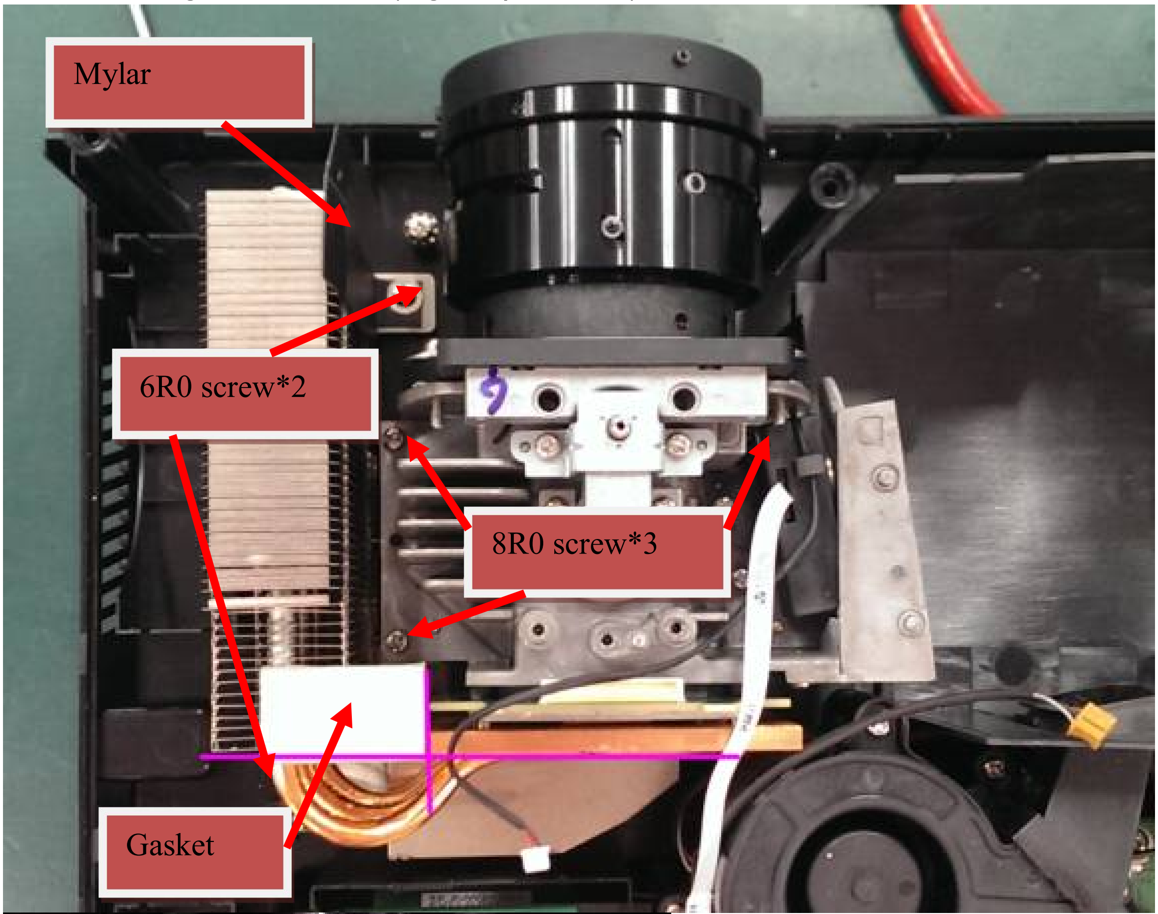


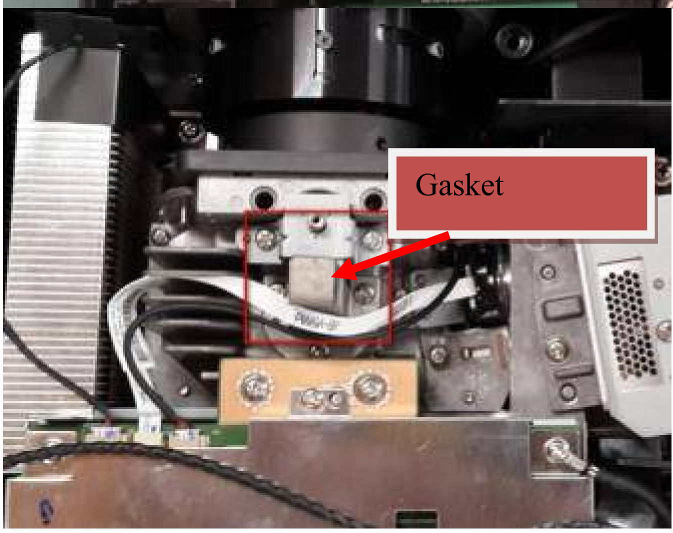


6. **Assemble ENG module on lower case**

a. Assemble mylar wire dressing on thermal H-sink then assemble ENG on lower case

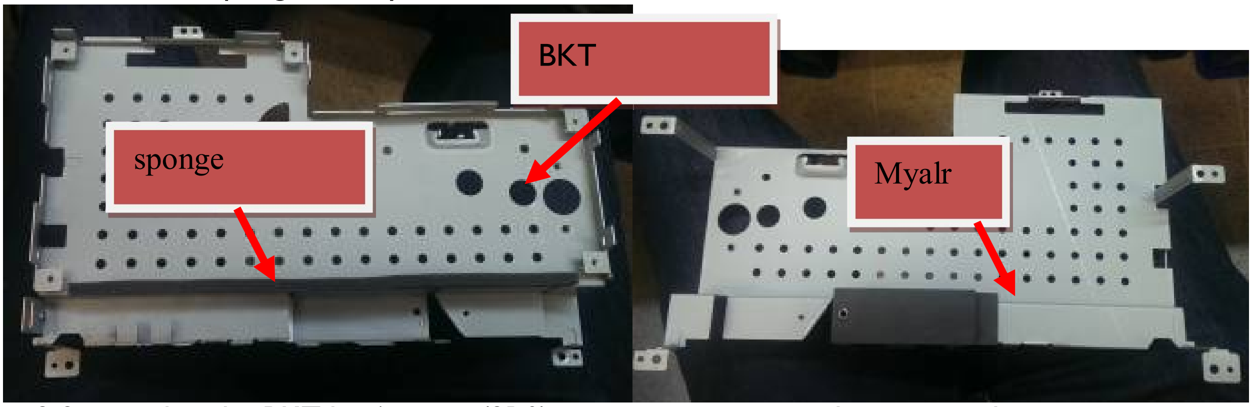
b. Assemble gasket on ENG (align chip BD & H)



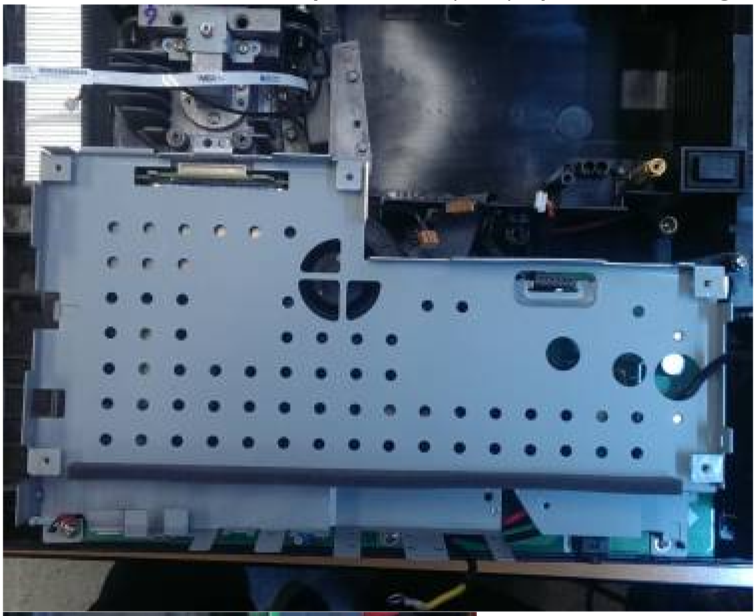


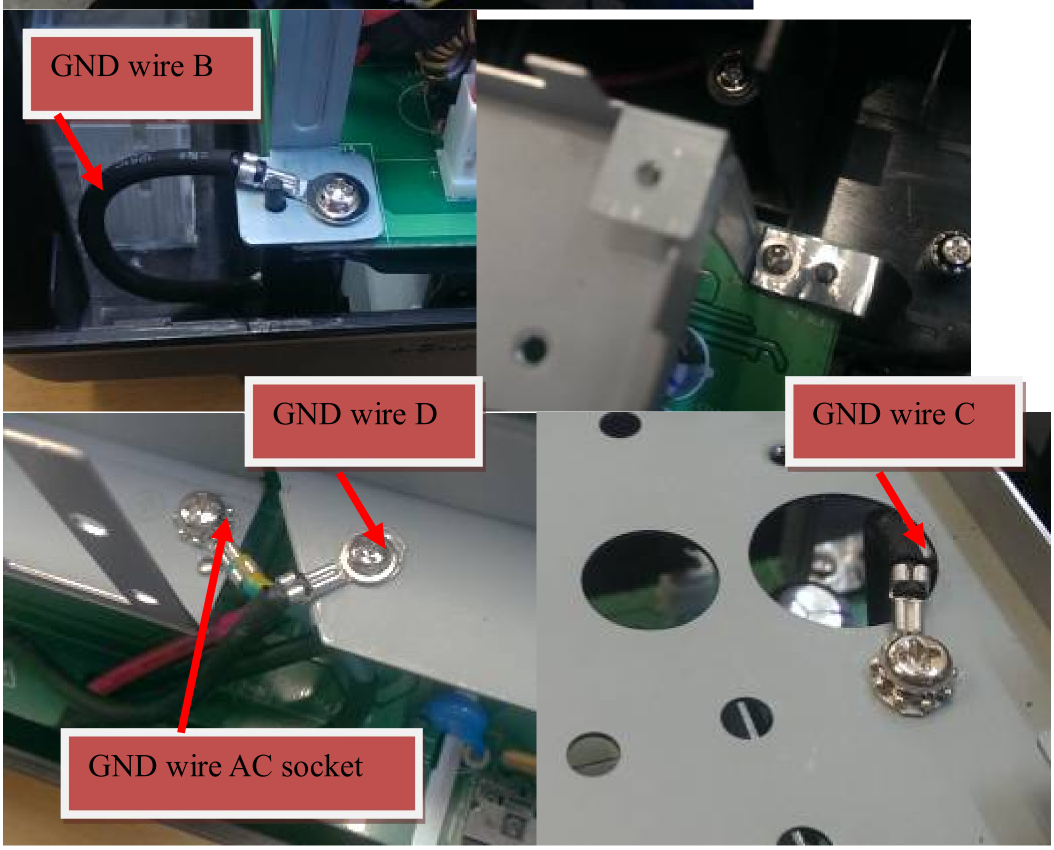
7. **Assemble BKT main BD**

8-1 assemble sponge and mylar on BKT



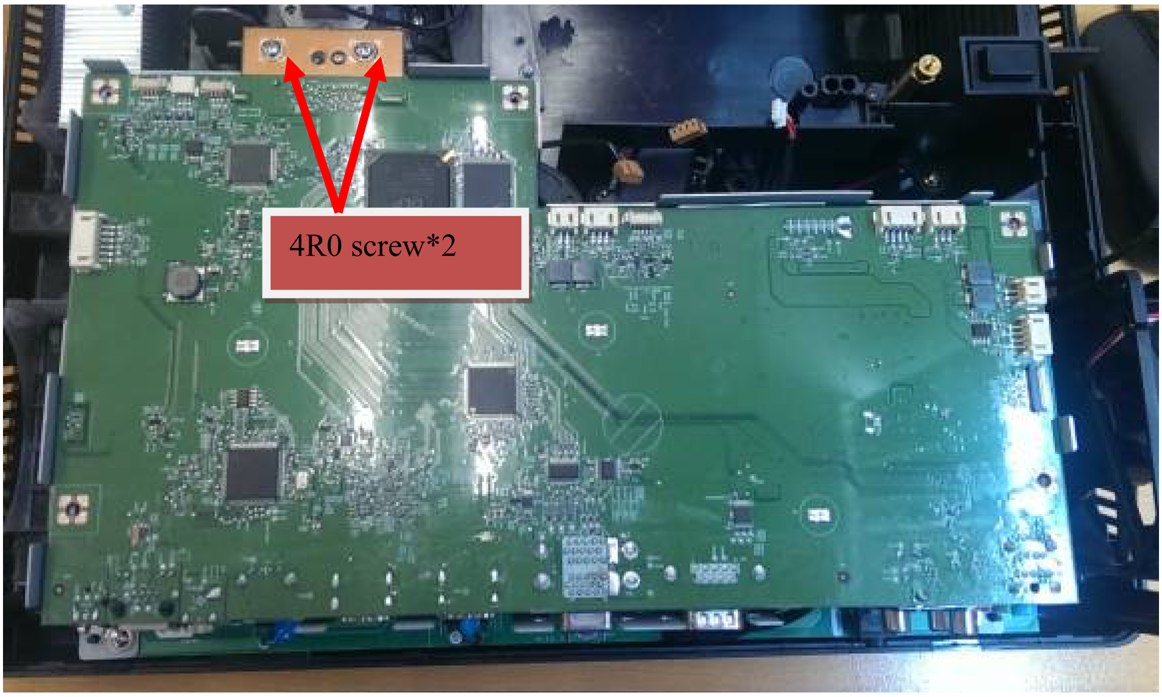
8-2 assemble the BKT by 4 screw (8R0) , please notice grounding wire and mylar.





8. **Assemble Main BD**

9-1 assemble the main BD



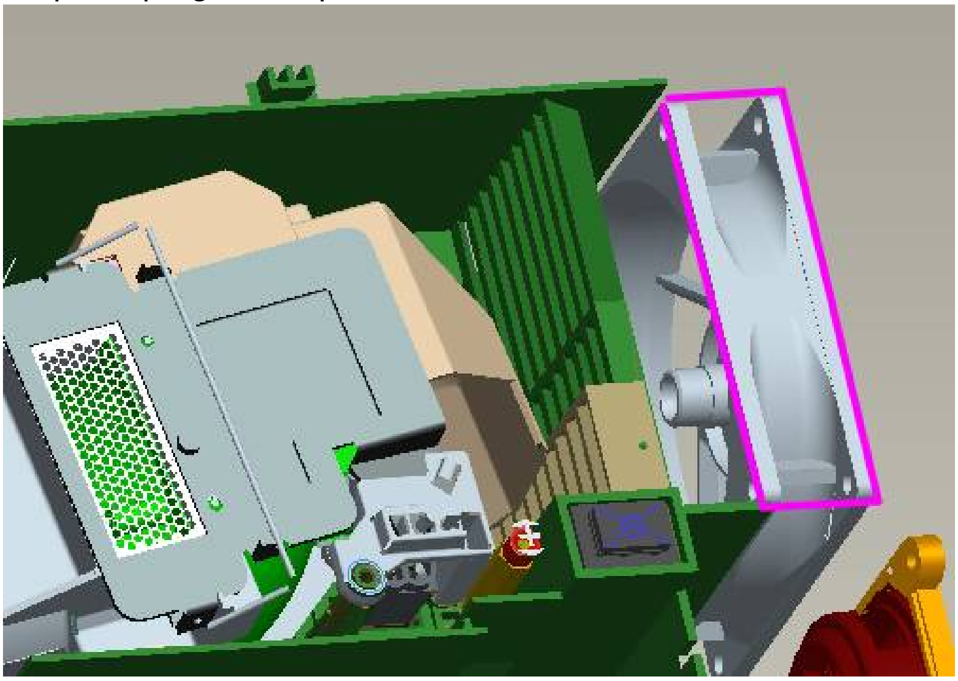
Important: please check golden pin align the connector then assemble.



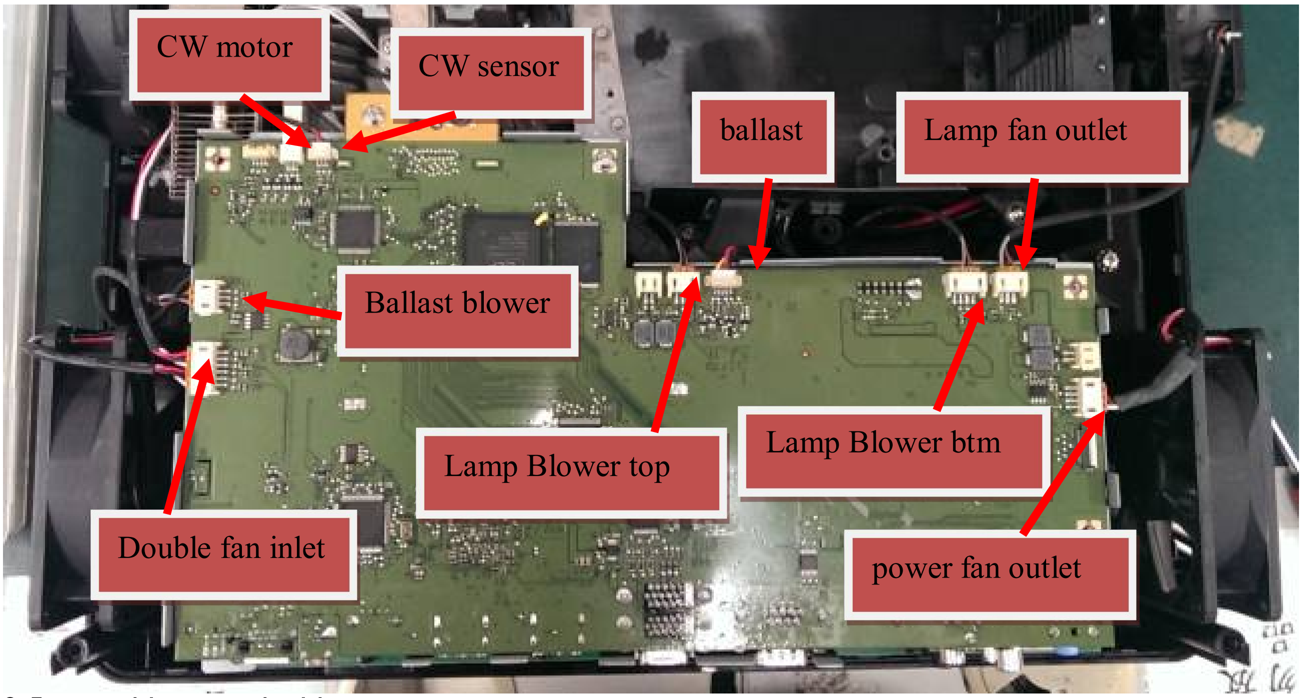
9-2 assemble 4 fan 9225, please notice the air flow directions.



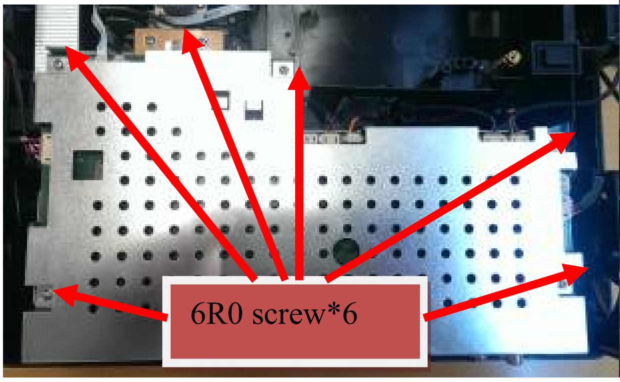
9-3 paste sponge on lamp fan

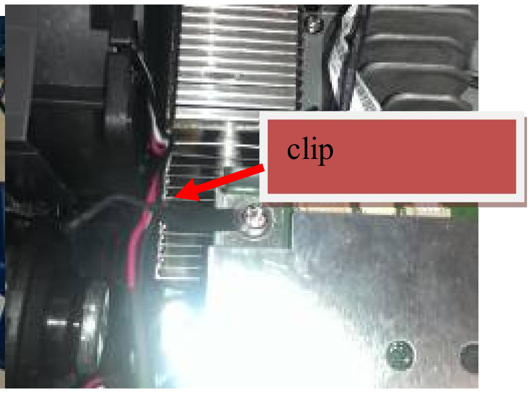


9-4 plug all connectors



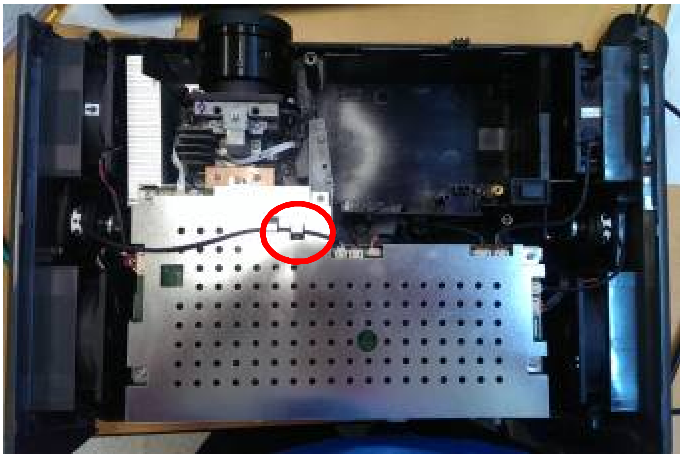
9-5 assemble main shielding

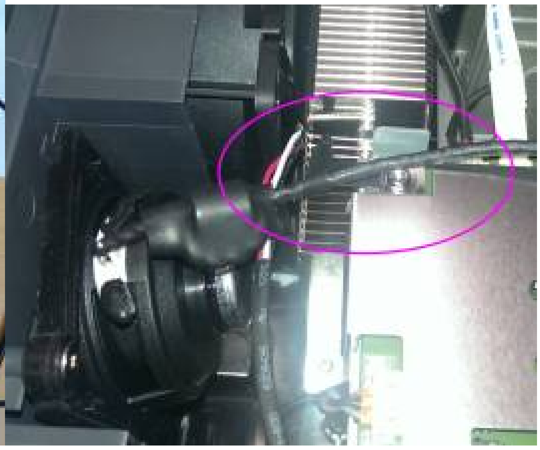




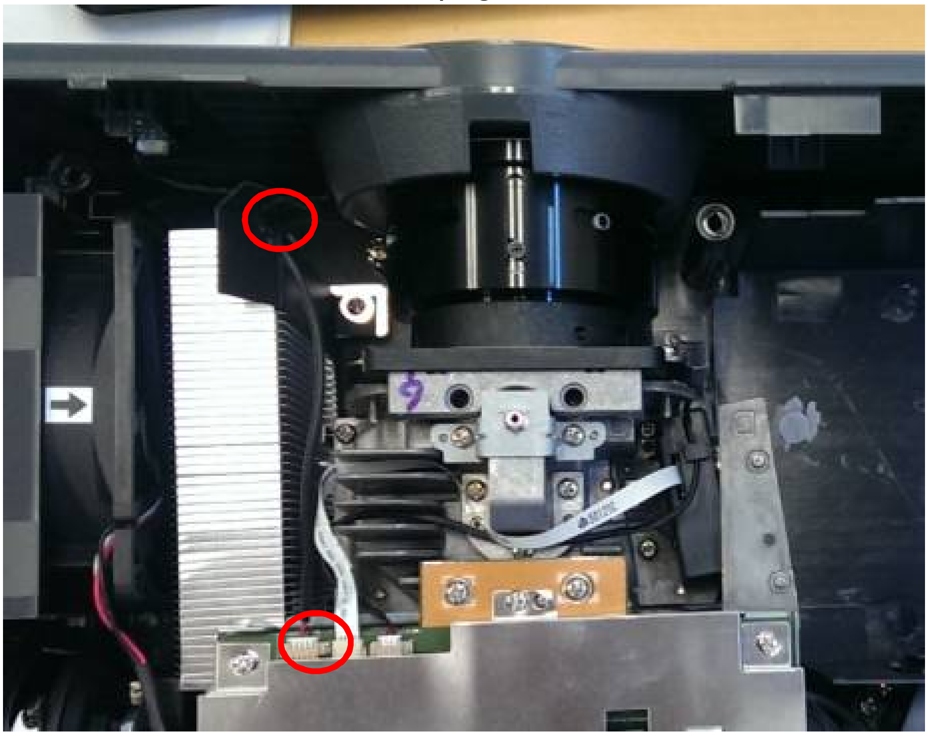
9. **Assemble the front, side, & rear case**

10-1 assemble side case and plug the speaker connectors, and notice the wire dressing





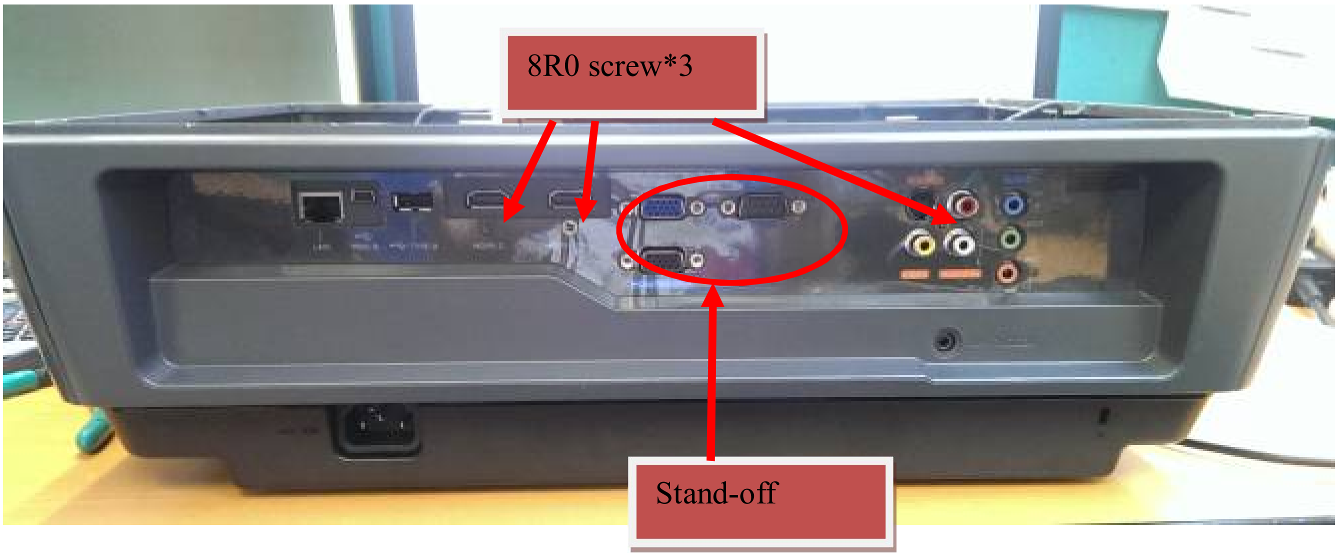
10-2 assemble the front case and plug the IR connector



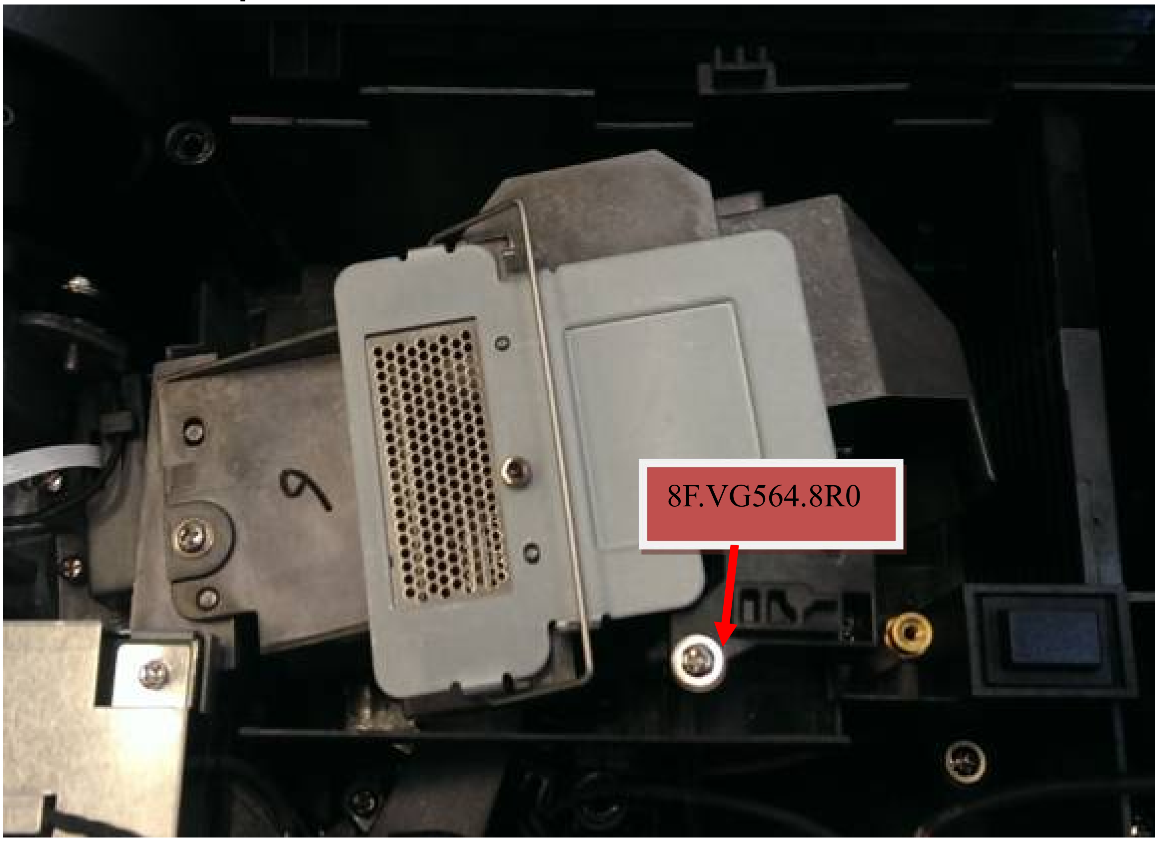
10-3 assemble zoom/ focus ring



10-4 assemble the rear case

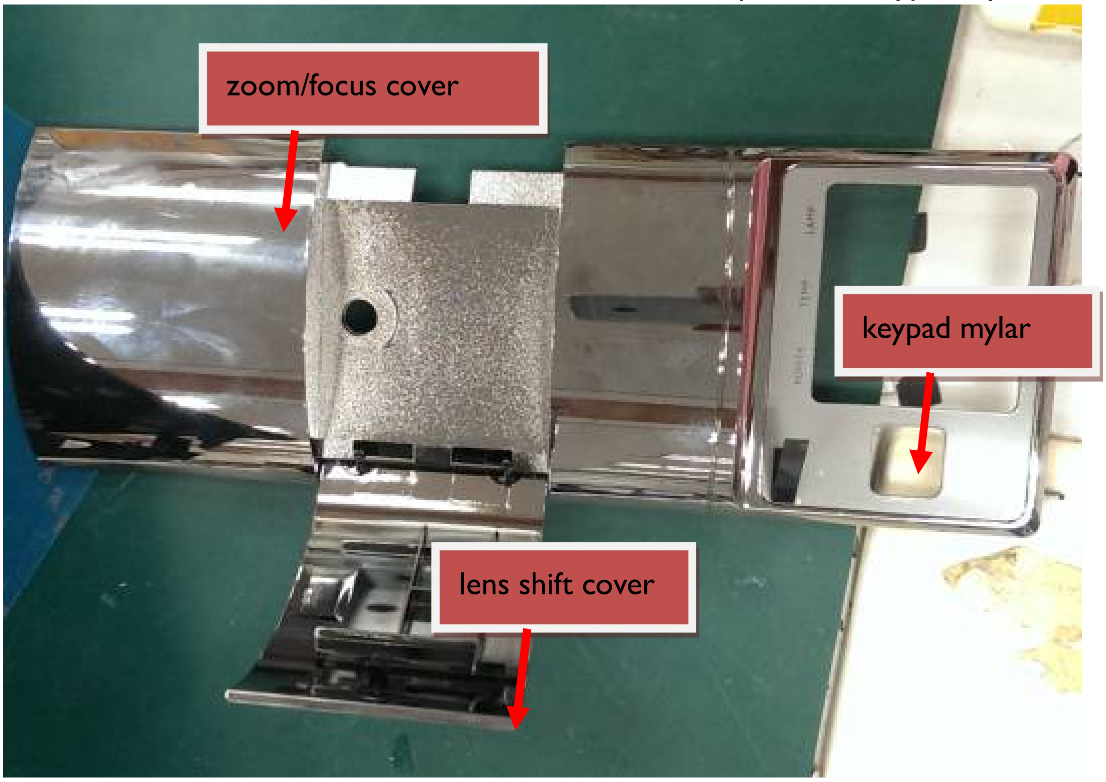


10. **Assemble lamp module.**



11. **Assemble upper case**

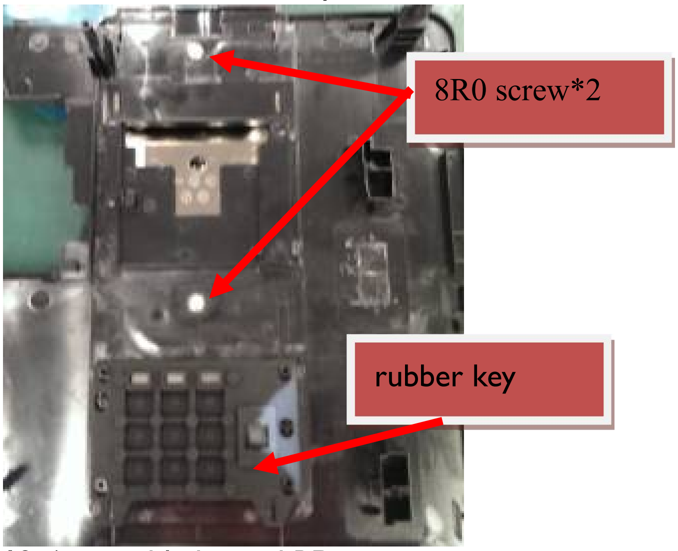
12-1 assemble lens shift cover on zoom/focus cover, and paste the keypad mylar.



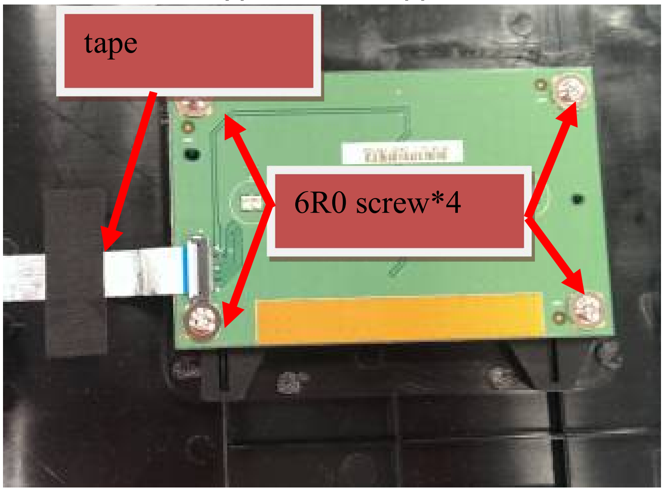
12-2 assemble lens shift cover assembly on upper case, and insert door lock through cover and upper case



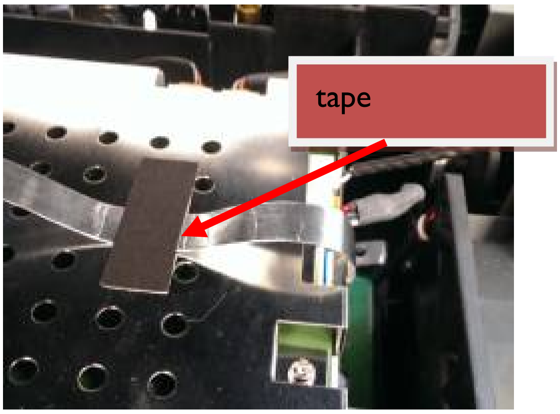
12-3 assemble rubber key and screw fix the cover



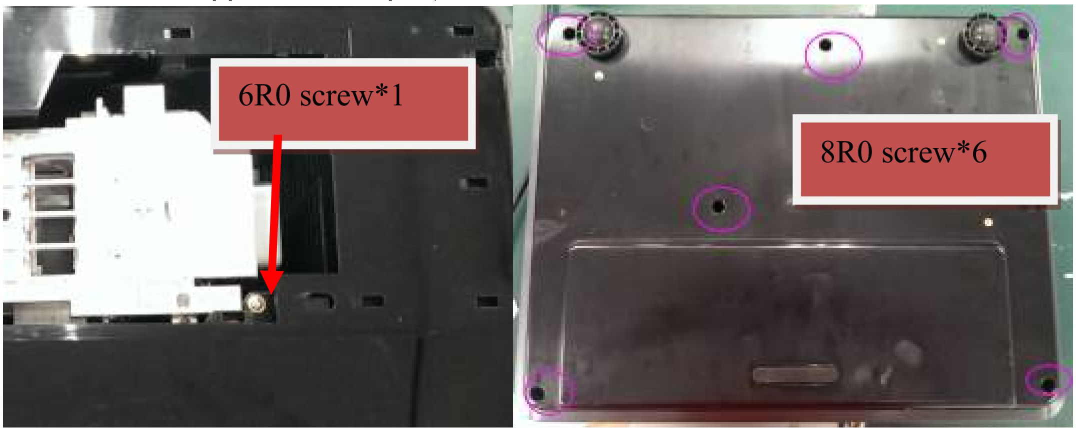
12-4 assemble keypad BD on upper case



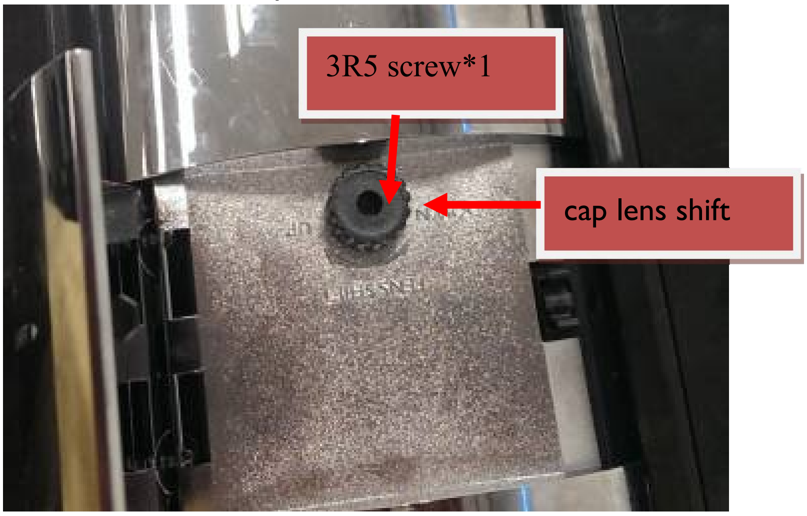
12-5 insert FFC on main BD and fixed with tape



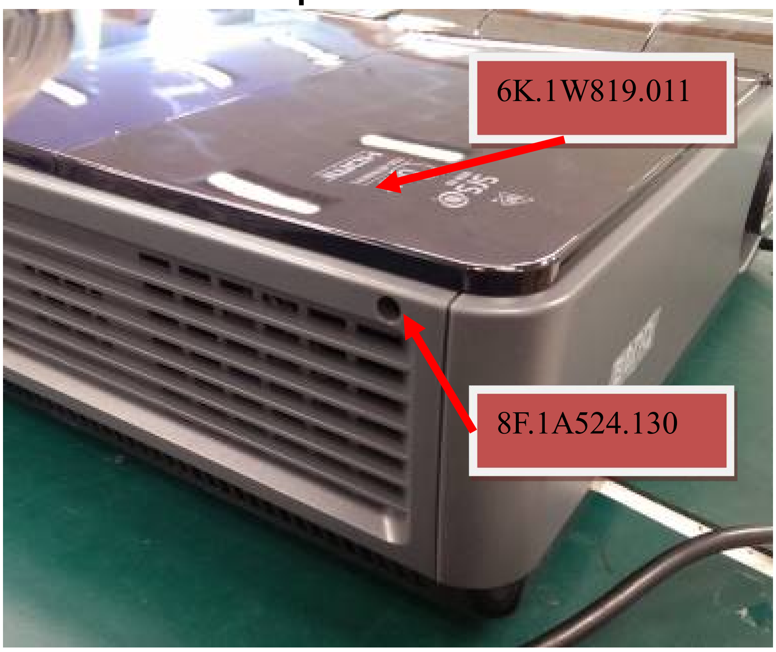
12-6 assemble upper case on projector



12-7 assemble the cap lens shift



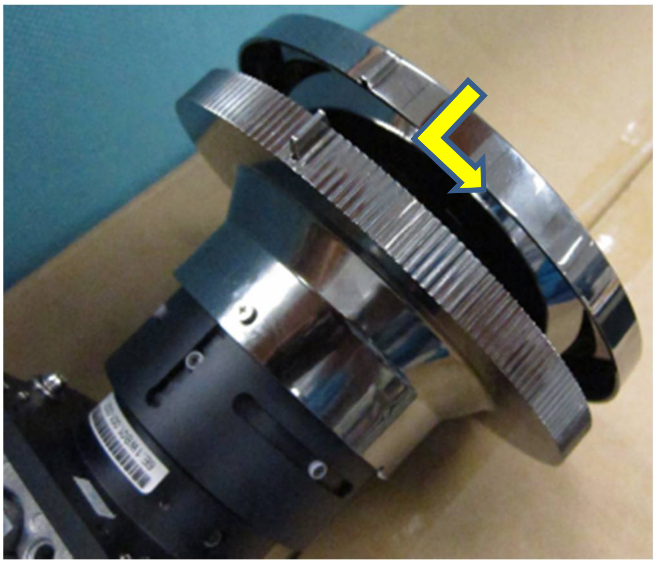
12. **Assemble the lamp door**



13. **Paste the label of logo**



14. **Assemble “RING FOCUS” and lock well. (Fig. 9-5)**



5.5 Block Diagram

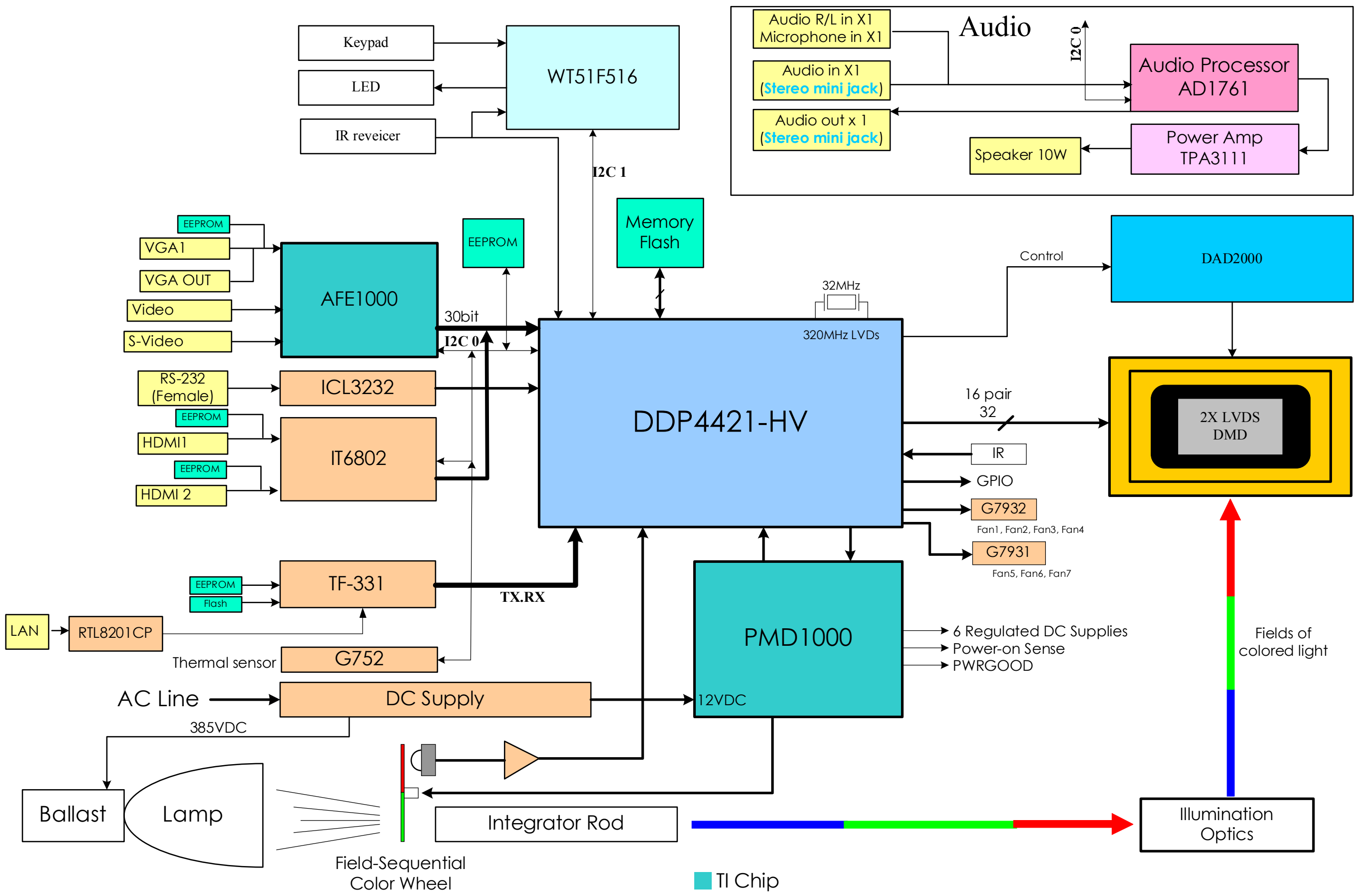
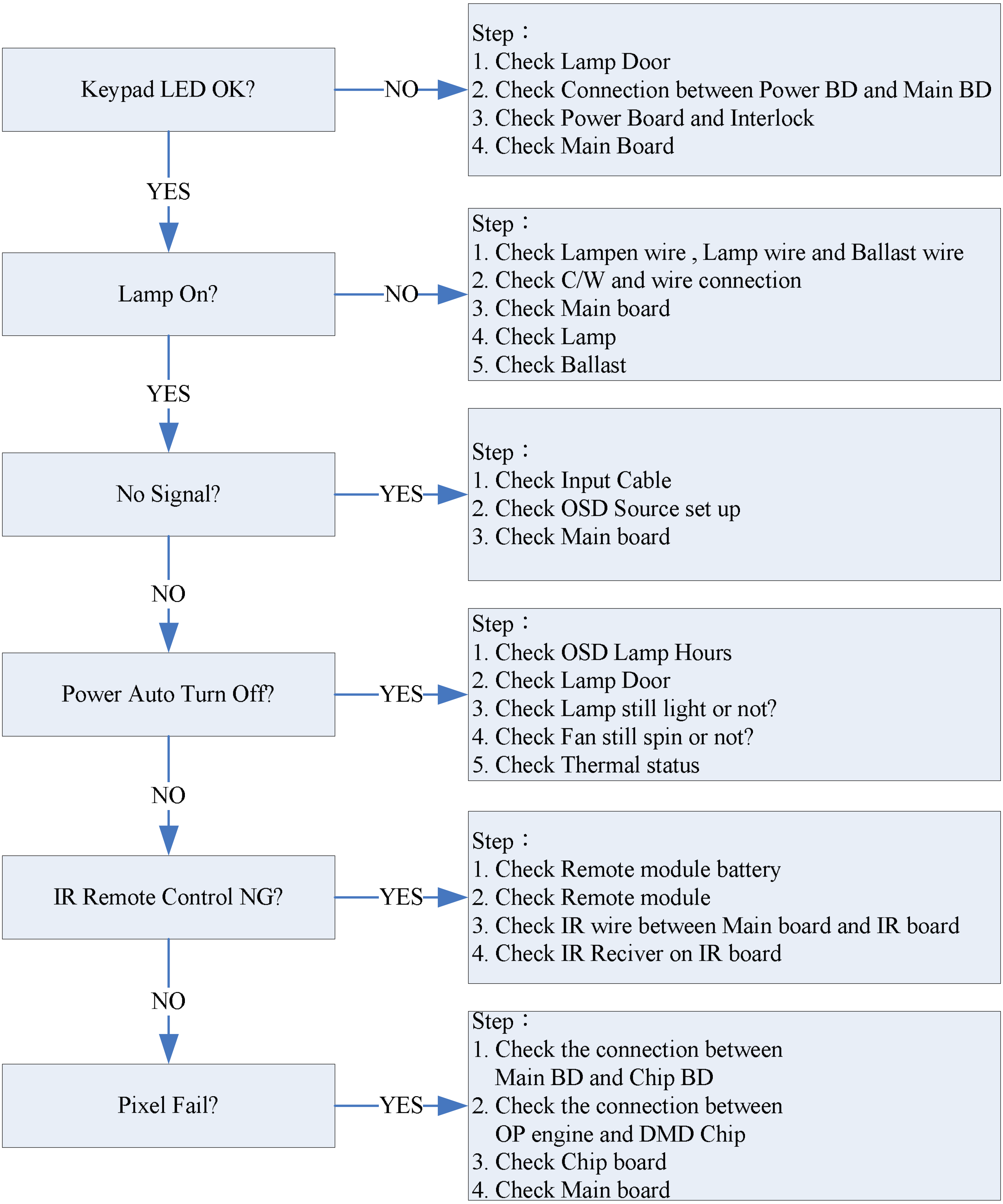


Figure 1 Main board & Input board Block Diagram

5.6 Trouble shooting

Chapter 1 System Analysis
Chapter 2 Optical & Optical Engine Trouble Shooting Guide
Chapter 3 Power Supply Trouble Shooting Guide
Chapter 4 LED Messages Definition
Chapter 5 Error Count Messages Definition

Chapter 1 - System Analysis



Chapter 2 Optical & Optical Engine Trouble Shooting Guide

No.	Item	Trouble Shooting Guide
1	Brightness	1. Change lamp
2	Uniformity	1. Change lamp
3	FOFO Contrast	1. Check ADC calibration 2. Check user's menu brightness & contrast are default 3. Clean DMD 4. Clean PL
4	ANSI Contrast	1. Clean PL 2. Clean DMD 3. Change PL
5	Color	1. Check color wheel delay 2. Replace CW if necessary
6	Color Uniformity	1. Change lamp
7	Blue Edge	1. Refer to Item#2-1 (attached below) 2. Change CM 3. Change SUB HSG
8	Blue/Purple Border	1. Refer to Item#2-1(attached below) 2. Change CM 3. Change SUB HSG
9	Focus	1. Change Projection Lens 2. Check parallel between PL datum and DMD
10	Dust	Clean DMD
11	Horizontal/Vertical Strips	1. Check connector between chip BD and Main BD 2. Re-install DMD with chip BD 3. Check if any pin of C-Spring is missing, damaged or dirty 4. Change new Chip BD 5. Change new DMD
12	Pixel Fail	Change new DMD

2-1. "Blue Edge" Trouble Shooting:

1. Re-adjust "Overfill" first.
   For Overfill Re-adjustment:
   i. Those 2 Adjustment Screws must be released for around 2 mm first.
   ii. Alignment Sequence:
      a. To adjust "Horizontal Adjustment Screw" firstly, then "Vertical Adjustment Screw".
      b. Refer to Figure 2-1..

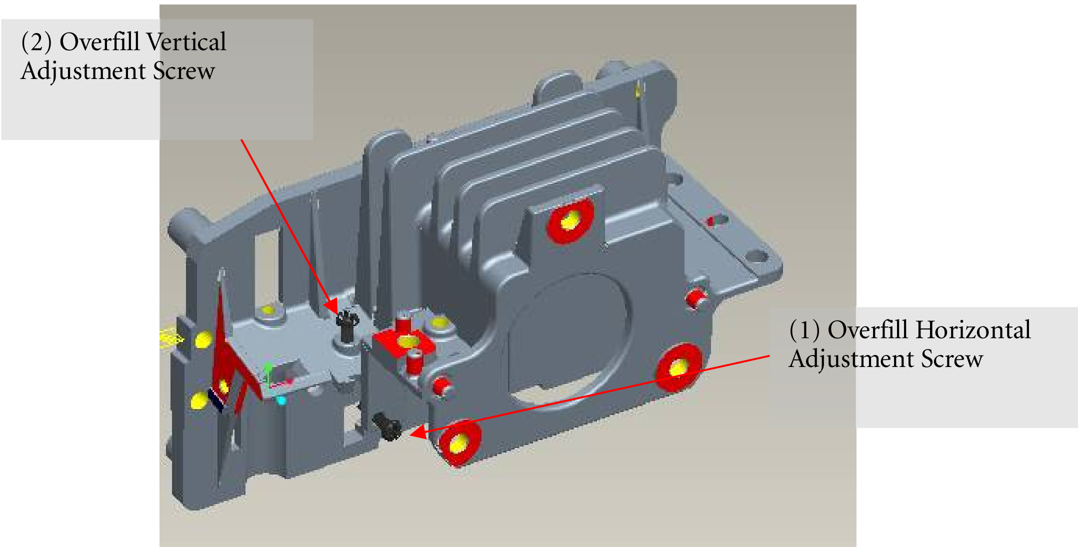


Fig. 2-1

II. Re-assemble LP module—include LP, LP Baffle, LP clip.

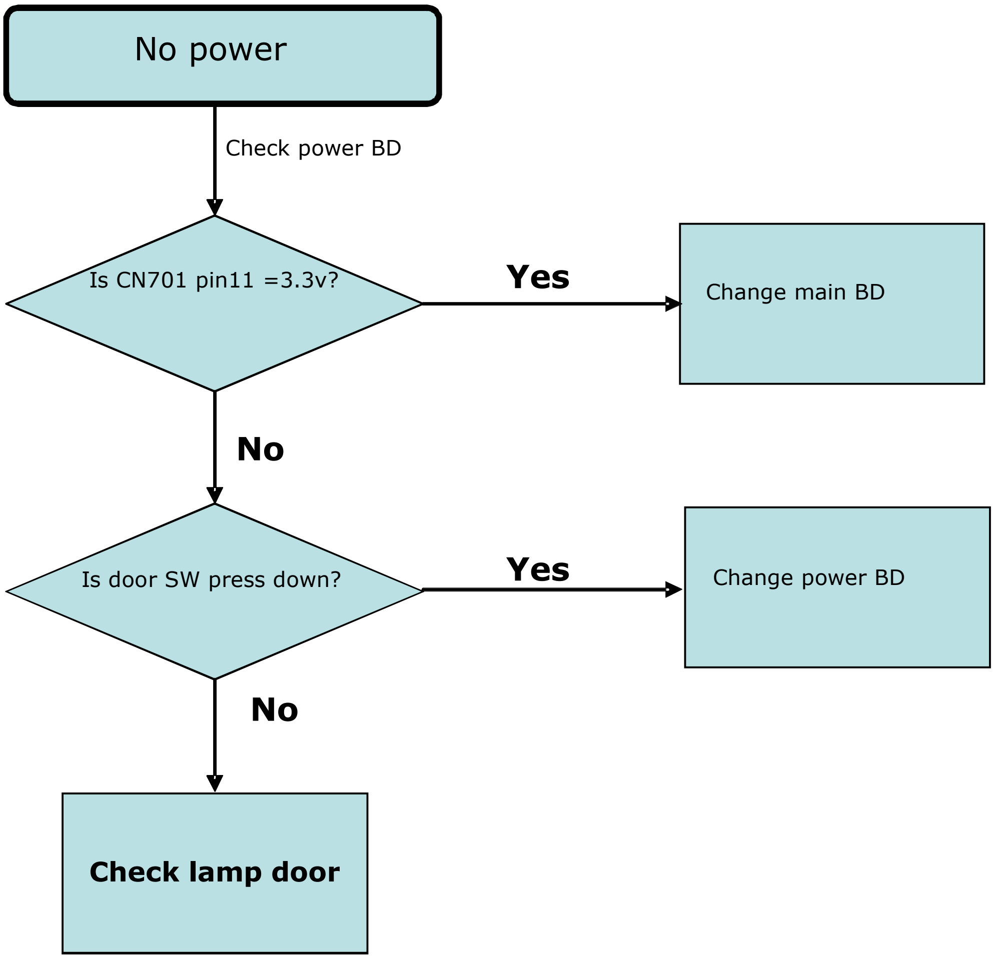
Chapter 3 Power Supply Trouble Shooting Guide

1. Introduction

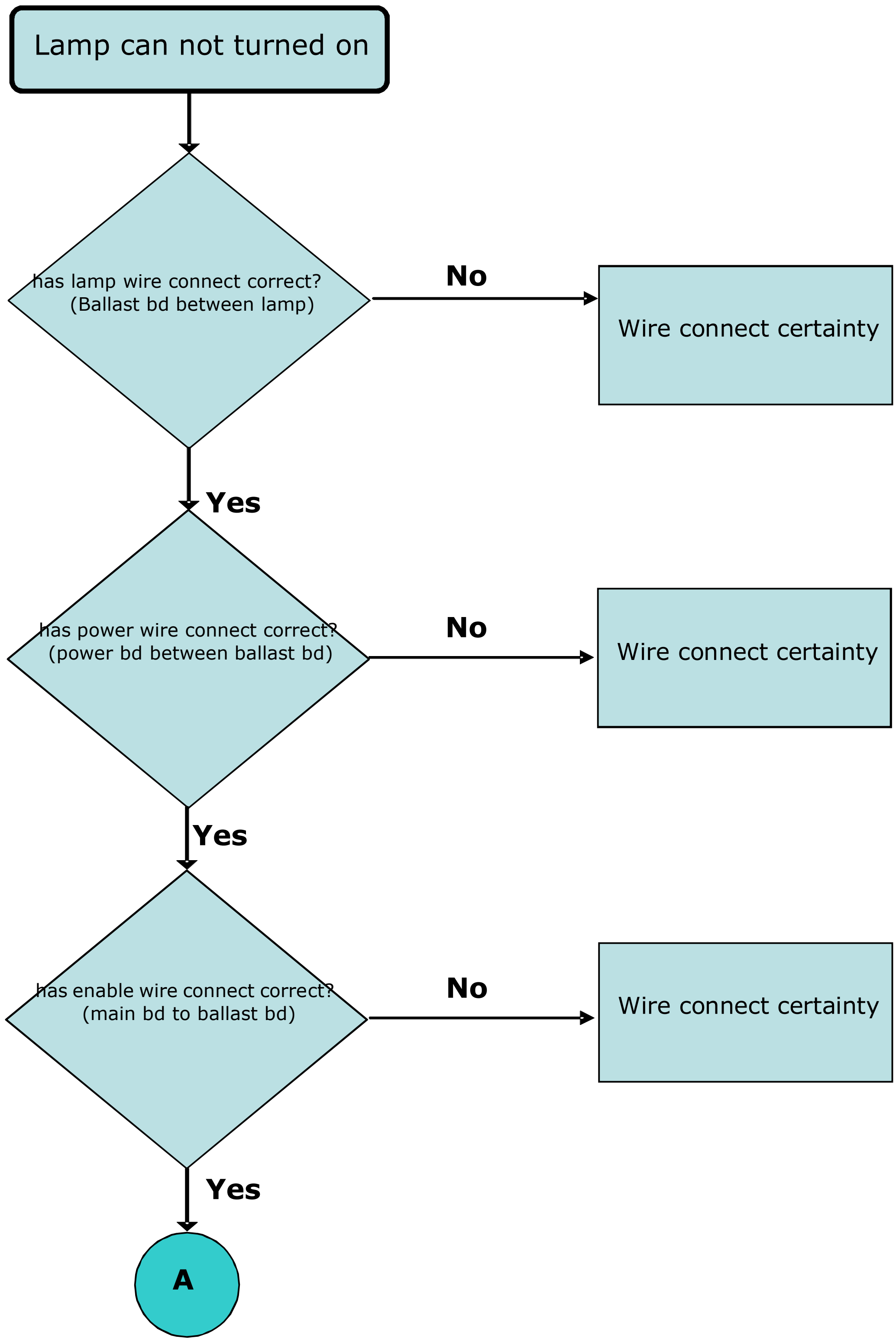
This document is prepared to be a guide to repair trouble sets, some problems happen more frequently are taken as example in it.

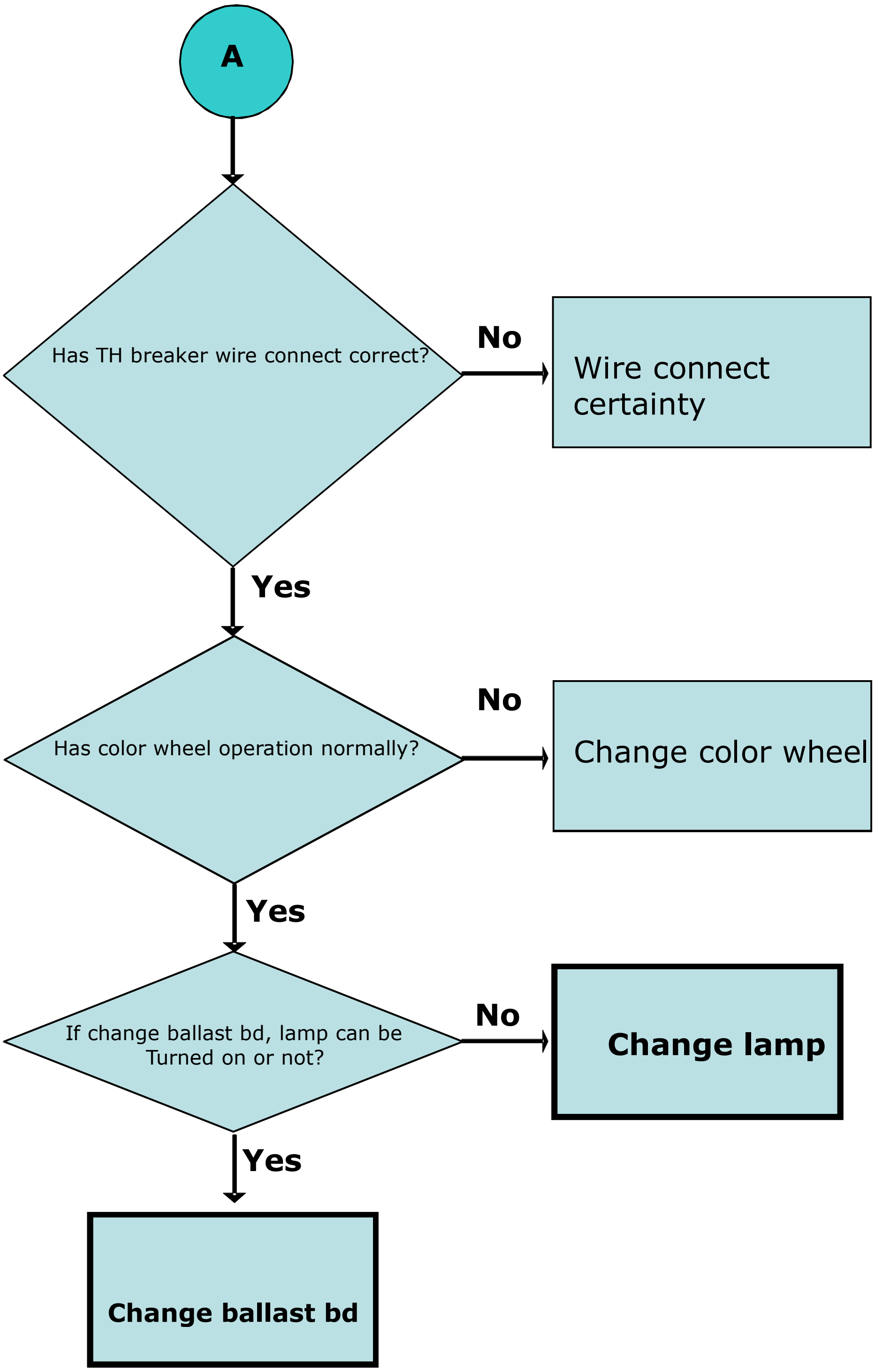
2. Problems

(a) no power



(b)lamp can not turned on




A
Has TH breaker wire connect correct?
No
Wire connect certainty
Yes
Has color wheel operation normally?
No
Change color wheel
Yes
If change ballast bd, lamp can be Turned on or not?
No
Change lamp
Yes
Change ballast bd

Chapter 4 - LED Messages Definition

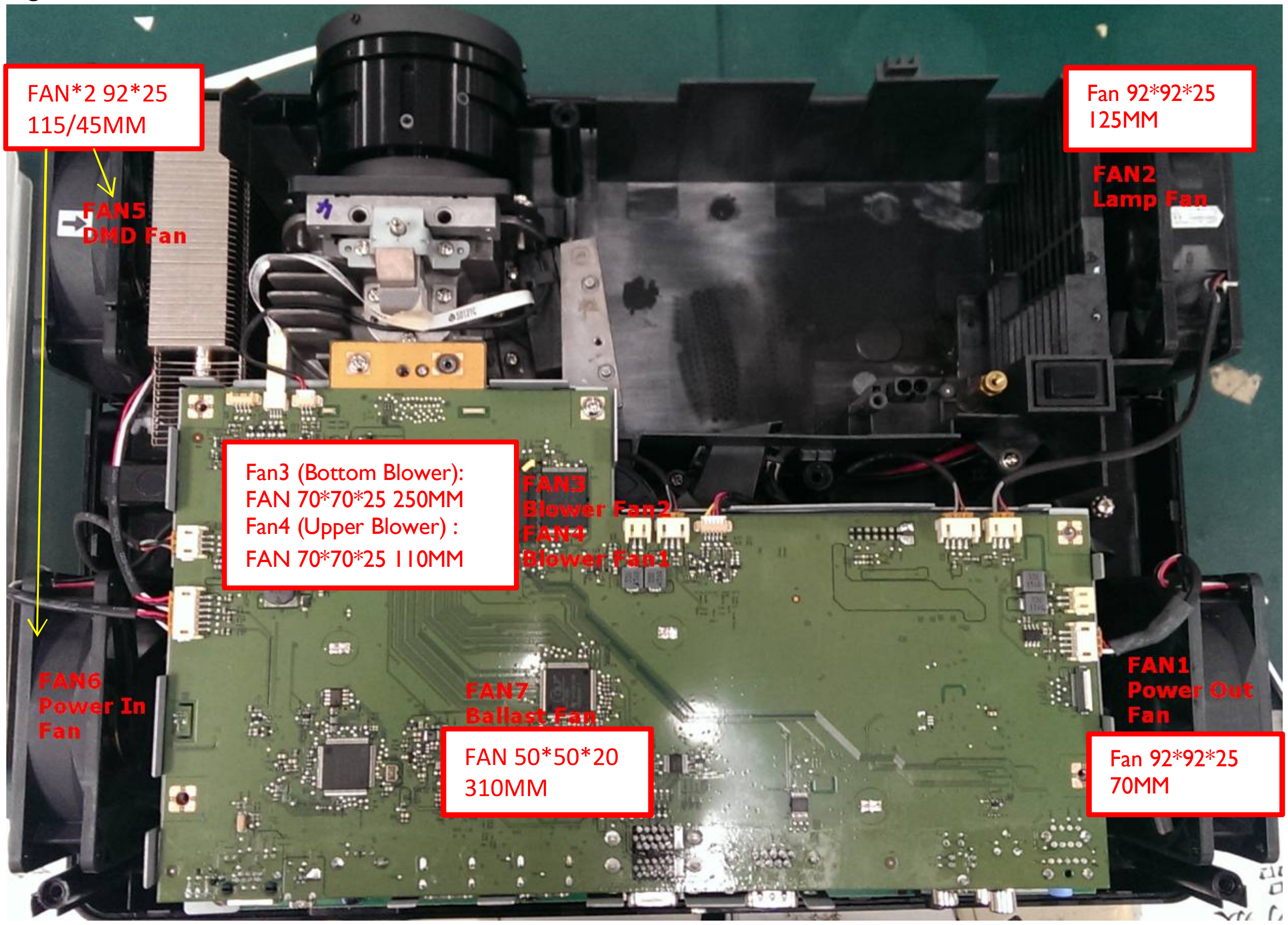
Power	Temp	Lamp1	Lamp2	Status	support
O	-	-	-	Stand-by	Y
G	-	-	-	Powering up(Burn-in powering up)	Y
G	-	-	-	Normal operation	Y
O	-	-	-	Normal power-down cooling(Burn-in powering-down cooling)	Y
R	R	R	-	Download	Y
G	-	R	-	CW start fail	Y
R	-	-	-	Scaler shutdown fail(data abord)	Y
G		O	-	Lamp1 Life exhausted	Y
				Burn-In Messages	
G	-	-	-	Burn-in ON	Y
G	G	G	-	Burn-in OFF	Y
				Lamp Error Messages	
-	-	R	-	Lamp1 error in normal operation	Y
-	-	O	-	Lamp is not lit up	Y
				Thermal Error Messages	
R	R	-	-	Fan 1 error (the actual fan speed is ±25% outside the desired speed)	Y
R	R	-	-	Fan 2 error (the actual fan speed is ±25% outside the desired speed)	Y
R	G	-	-	Fan 3 error (the actual fan speed is ±25% outside the desired speed)	Y
R	G	-	-	Fan 4 error (the actual fan speed is ±25% outside the desired speed)	Y
R	R	-	-	Fan 5 error (the actual fan speed is ±25% outside the desired speed)	Y
R	R	-	-	Fan 6 error (the actual fan speed is ±25% outside the desired speed)	Y
R	G	-	-	Fan 7 error (the actual fan speed is ±25% outside the desired speed)	Y
G	R	-	-	Temperature 1 error (over limited temperature)	Y

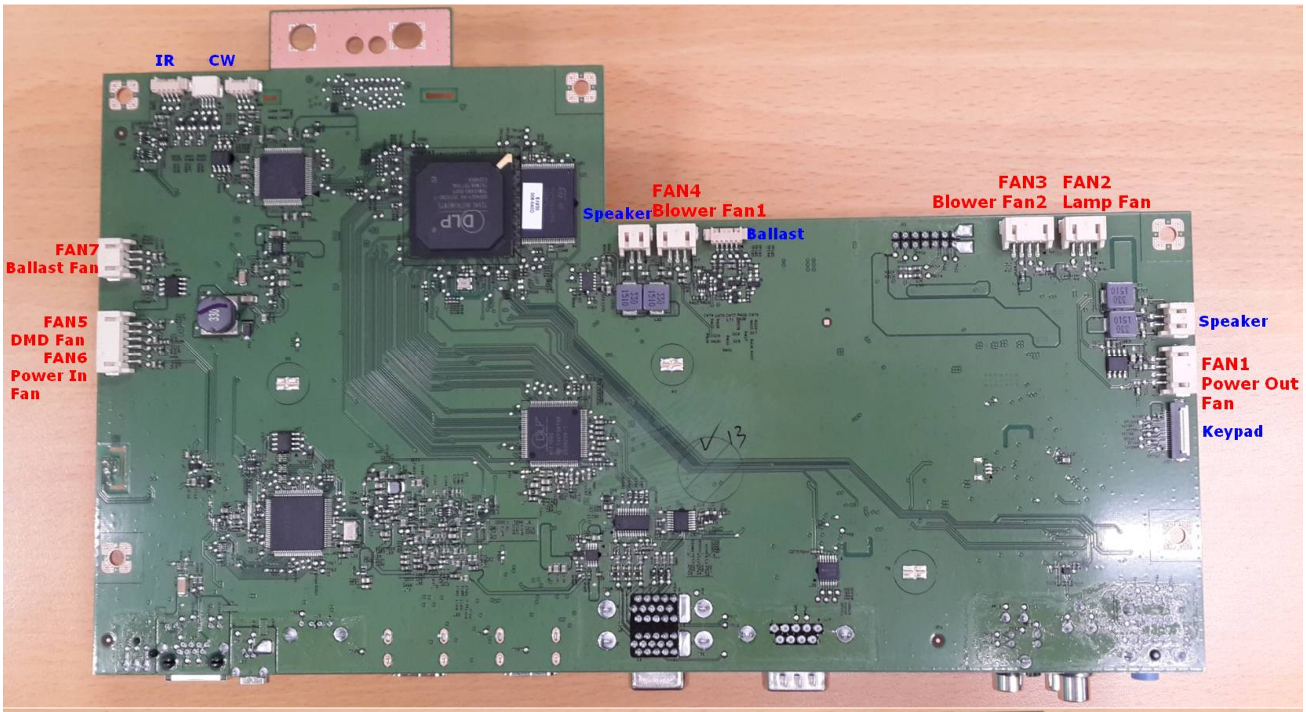
Chapter 5 - Error Count Messages Definition

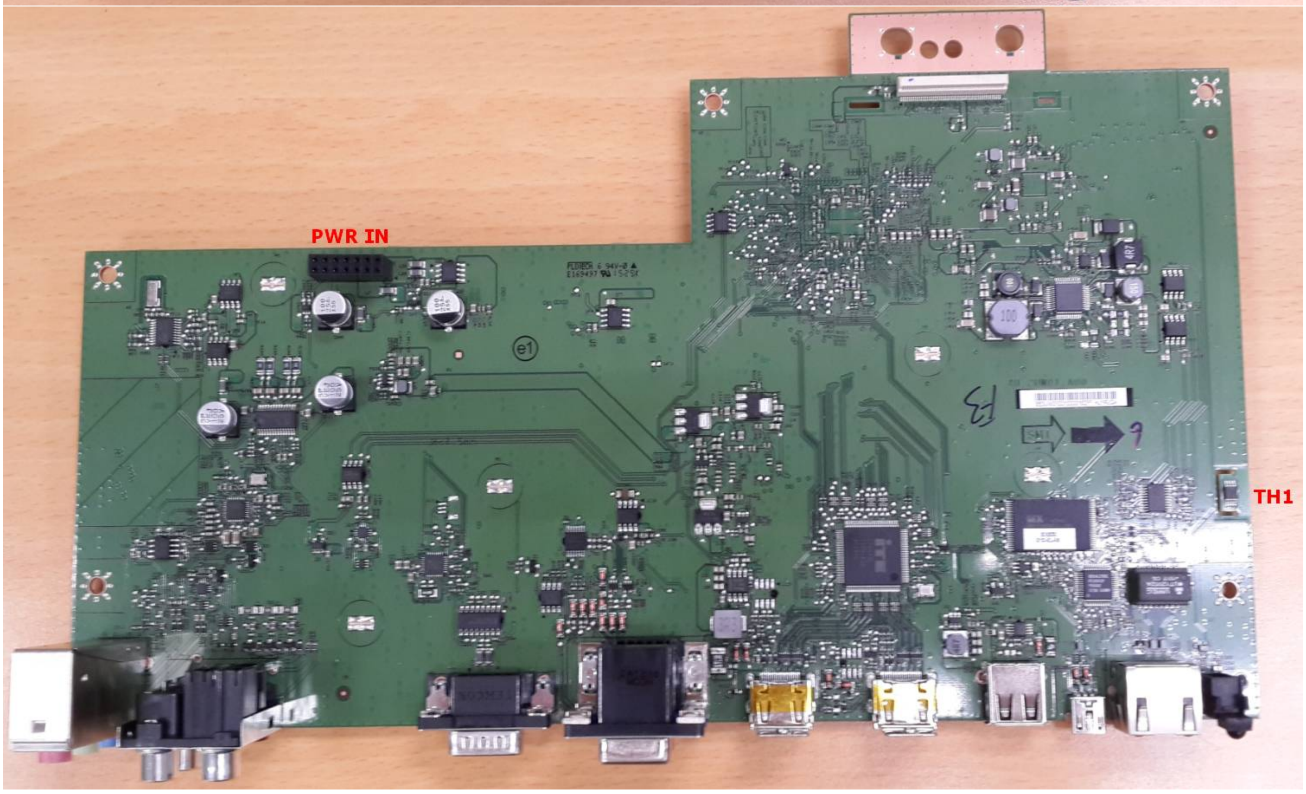
Error Count	Definition	Specification	Repair Action(Check/Replace Parts)
Lamp Lit Fail	Power on lit fail twice count	power on lit fail twice count	1. Check Lamp Start wire connection 2. Check Lamp 3. Check Ballast board 4. Check Power board 5. Check Main board
Lamp Both Fail	Lamp Both off abnormally	Lamp Both off abnormally	1. Check Lamp Start wire connection 2. Check Lamp 3. Check Main board
Lamp Fail	Lamp Off abnormally	System Detect LampLit NG	1. Check Lamp Start wire connection 2. Check Lamp 3. Check Ballast board 4. Check Power board 5. Check Main board
Fan 1 Speed Error	Power Out Fan Speed Error	Speed Over ± 25%	1. Check Fan1 wire connection 2. Check Fan1 3. Check Main board
Fan 2 Speed Error	Lamp Fan Speed Error	Speed Over ± 25%	1. Check Fan2 wire connection 2. Check Fan2 3. Check Main board
Fan 3 Speed Error	Blower Fan2 Speed Error	Speed Over ± 25%	1. Check Fan3 wire connection 2. Check Fan3 3. Check Main board
Fan 4 Speed Error	Blower Fan1 Speed Error	Speed Over ± 25%	1. Check Fan4 wire connection 2. Check Fan4 3. Check Main board
Fan 5 Speed Error	DMD Fan Speed Error	Speed Over ± 25%	1. Check Fan5 wire connection 2. Check Fan5 3. Check Main board
Fan 6 Speed Error	Power In Fan Speed Error	Speed Over ± 25%	1. Check Fan6 wire connection 2. Check Fan6 3. Check Main board
Fan 7 Speed Error	Ballast Fan Speed Error	Speed Over ± 25%	1. Check Fan7 wire connection 2. Check Fan7 3. Check Main board
Sensor 1 Open Error	Main Board Thermal Sensor Error	Detect Sensor 1 (open)	1. Check Thermal sensor 1 2. Check Main board
Sensor 1 Short Error	Main Board Thermal Sensor Error	Detect Sensor 1 (short)	
Temperature 1 Error	Over temperature	Thermal sensor detects >61℃	
Color Wheel Error	Start the Color wheel Error	Color wheel operating NG	1. Check connection between C/W and M/B 2. Check Color wheel 3. Check CW sensor board 4. Check main board
Color Wheel Spin Error	Color Wheel Spin Error	Color Wheel Spin Error	1. Check connection between C/W and M/B 2. Check Color wheel 3. Check CW sensor board 4. Check main board
Fan IC I2C Error	Fan IC I2C Error	Fan IC I2C Error	1. Check main board

Abnormal Power down	System abnormal power down	System abnormal power down	1. Check if user unplug power cord before finish cooling 2. Check connection between PWR/B and M/B 3. Check door switch 4. Check power board 5. Check main board

Fig. 5-1 Fan and Sensor Placement




IR
CW
FAN4
Blower Fan1
Speaker
Ballast
FAN3
Blower Fan2
FAN2
Lamp Fan
FAN7
Ballast Fan
FAN5
DMD Fan
FAN6
Power In
Fan
Speaker
FAN1
Power Out
Fan
Keypad


PWR IN
TH1

Appendix 1 – Screw List / Torque

Model name : SX930

	No.	Screw P/N	Description				Q'TY	Torque (kgf-cm)	Where use
			Type	Head	Length	Coating			
M2.5	1	8F.00430.6R0	MACH	PH	6	NI	4	3.5~4.5	inlet case & Speaker(2*)
									outlet case & Speaker(2*)
M3.0	1	8F.VG564.8R0	TAP	PH	8	NI	15	3.5~4.5	Lamp module & lamp box(1*)
								4.0~5.0	Lens CVR & UC (2*)
								4.5~5.5	Lower case & lamp box (4*)
									Lower case & EMI BD(2*)
								5.5~6.5	Lower case & PWR BD(6*)
	2	8F.VG524.6R0	TAP	PH	6	NI	11	4.5~5.5	Lower case & EMI BD(2*)
									Lamp wire & lamp box(1*)
									Heat-pipe & Case Lower(2*)
								5.5~6.5	Lower case & Ballast (2*)
									Upper case & Keypad BD(4*)
	3	8F.VA564.8R0	TAP	PH	8	NI	17	3.5~4.5	Blower & blower frame(4*)
								5.5~6.5	OM & Lower case(3*)
									Upper case & Lower case(6*)
									Lower case & Nozzle(2*)
									Lower case & blower frame(2*)
	4	8F.5A724.8R0	MACH	FH	8	B-NI	5	4.5~5.5	Rear case & Main board RCA(1*)
									Rear case & Main board HDMI(2*)
									BKT AC SOCKET & AC SOCKET(2*)
	5	8F.1A524.6R0	MACH	PH	6	NI	6	5.5~6.5	SHD MB & BKT MB(6*)
	6	8F.1A524.130	MACH	PH	13	NI	1	5.5~6.5	Lamp door & Outlet case (1*)
	7	8F.1G524.6R0	MACH	PH	6	NI	2	5.5~6.5	Upper case & Lamp frame(1*)
									GND wire & BKT MB(1*)
	8	8F.1G524.4R0	MACH	PH	6	NI	2	5.5~6.5	MB & OPT engine(2*)
	9	8F.1G524.240	MACH	PH	24	NI	2	5.5~6.5	Blower & Lower case(2*)
M4.0	1	8F.1D526.6R0	MACH	TAPTILE	6	NI	6	5.5~6.5	AC Wire & BKT MB(1*)
									EMI BD GND WIRE & MB BKT(1*)
								5.5~6.5	Lower case for ceiling (4*)

- Screw Type: 11 types
- Screw quantity: 71

Stand off:

	No.	Screw P/N	Description				Q'TY	Torque (kgf-cm)	Where use
			Type	Head	Length	Coating			
#4-40	1	8F.00678.021	MACH	STAND	8	NI	6	5.0+/-0.5	Rear case & D-SUB(6*)
	2	8F.00544.300	MACH	HEX	30	NI	1	3.0 +/-0.5	UC ==LAMP BOX(1*)

Model Name : SX930 (OM)										
MODULE	**Type**	**P/N**	**Description**				**Torque**	**Where use**	**Unit**	**Q'ty**
			Type	**Head**	**Length**	**Surface**	**(kgf-cm)**			
DMD HSG	M2	8F.8A752.3R0	MACH	PH	3.0	B-NI	1.2+/-0.5	Shield Link VS. BKT Link Lamp	1	2
								CVR Lens VS HSG DMD	1	
	M3	6E.J9305.001	MACH	PH	7.5	NI	6.5+/-0.5	H-Sink VS. HSG DMD	4	4
		8F.1A554.6R0	MACH	PAN	6.0	NI	6.5+/-0.5	LP Adjustment	2	10
								Clip LP VS. HSG DMD	1	
								BKT Link Lamp VS. HSG DMD	2	
								Sub HSG VS. HSG DMD	2	
								CW BKT VS. HSG DMD	1	
								Lens Shift Plate VS. HSG DMD	2	
		8F.1A554.4R0	MACH	PAN	4.0	NI	6.5+/-0.5	HLD Lens Shift VS. HSG DMD	3	3
SUB HSG MODULE	M3	8F.1A554.6R0	MACH	PAN	6.0	NI	6.5+/-0.5	Clip Down VS. SUB HSG	1	1
	M2	8F.8A752.3R0	MACH	PH	3.0	B-NI	1.2+/-0.5	FM2 Clip VS. SUB HSG	1	1
CW MODULE	M2	8F.8A752.3R0	MACH	PH	3.0	B-NI	1.2+/-0.5	CVR Anti Dust VS. BKT CW	1	2
							0.75+/-0.25	CW Sensor BD VS. BKT CW	1	
	M2.5	8F.00345.5R6	MACH	PH	8.0	B-NI	3.5+/-0.5	CW VS. BKT CW	3	3
LENS	M2	8F.1A752.8R0	MACH	PH	8.0	B-NI	2.2+/-0.5	Lens VS. HLD Adapter	4	4
	M2	8F.8A752.3R5	MACH	PH	3.0	B-NI	2.2+/-0.5	CAP LENS. HLD VS. Shaft	1	1
	M3	6E.0NS03.001	MACH	PH	7.5	NI	6.5+/-0.5	Lens VS. HSG DMD	3	3
	M2	8F.00345.011	MACH	PH	4.0	B-NI	3.5+/-0.5	Ring Zoom VS. Lens	1	1
LAMP MODULE	M2	8F.8A752.3R0	MACH	PAN	3.0	B-NI	1.2+/-0.5	Frame Louver VS. HLD Lamp	2	4
								Fin VS. HLD Lamp	1	
								MESH VS. HLD Lamp	1	
	M3	8F.VA564.6R0	TAP	PAN	6.0	NI	4.0+/-0.5	HLD Connector VS. Plate Lamp	1	1
		8F.VG564.8R0	TAP	PH	8.0	NI	4.0+/-0.5	HLD Connector VS. Lamp Wire	1	1
		8F.1G524.8R0	MACH	PH	8.0	NI	6.5+/-0.5	Lamp Module VS. BKT Link	1	1
		8F.2R754.6R0	MACH	HAN	6.0	NI	6.5+/-0.5	Plate Lamp VS. HLD Lamp	1	1
		8F.1A554.4R0	MACH	PAN	4.0	NI	6.5+/-0.5	Clip AL VS. HLD Lamp	4	11
								Clip Lamp VS. HLD Lamp	3	
								TOP MESH VS HLD Lamp	1	
								CVR LAMP VS HLD Lamp	3	
		8F.1D224.5R0	MACH	PAN	5.0	NI	4.0+/-0.5	LAMP WIRE VS. LAMP	2	2
SUM										**56**

Appendix 2 - Code List: IR / RS232 / DDC Data

Remote Control Code:

1. IR Code

(projector must support 0x02,0X4E,0X4F power on/off command)

Key	Function	Description	Code	Support	ID and Protocol	
1	Wireless		0x00	No	Frequency	38 KHz
2	Power	This button will on/off the projector.	0x02	No	Protocol	NEC Format
3	Freeze	This button will freeze/ unfreeze the image.	0x03	Yes	Custom Code	0x0030
4	Source	This button will show available source options.	0x04	Yes		
5	Page Up	By pressing "Page Up" button, could enable Page Up function.	0x05	No		
6	Page Down	By pressing "Page Down" button, could enable Page Down function.	0x06	No		
7	Eco Blank	This button will turn projector into/out of blank mode.	0x07	Yes		
8	Auto	This button will automatically adjust projector's picture quality.	0x08	Yes		
9	Keystone +		0x09	No		
10	Keystone -		0x0A	No		
11	Up	When there is no OSD on screen, this button will correct optical keystone in negative direction. When there is OSD menu on screen, this button will move the chooser item to the upper one.	0x0B	Yes		
12	Down	When there is no OSD on screen, this button will correct optical keystone in positive direction. When there is OSD menu on the screen, this button will move the chooser item to the next one.	0x0C	Yes		
13	Left	When there is no OSD on screen, this button will correct optical keystone in positive direction. When there is OSD menu on screen, this button will move the chooser item to the left one.	0x0D	Yes		
14	Right	When there is no OSD on screen, this button will correct optical keystone in positive direction. When there is OSD menu on screen, This button will move the chooser item to the right one.	0x0E	Yes		
15	Menu/Exit	This button will turn on/off OSD menu.	0x0F	Yes		
16	Mode	When there is no OSD menu on the screen, the button will change picture mode. When there is OSD menu on the screen, this button will excite the item chooser.	0x10	Yes		
17	Contrast	Displays the CONTRAST setting bar.	0x11	Yes		
18	SWAP		0x12	No		
19	Aspect	Select the display aspect ratios.	0x13	Yes		



20	Mute	Mutes the built-in speaker.	0x14	Yes	
21	Enter/OK	Enter key for OSD menu.	0x15	No	
22	Brightness	Displays the BRIGHTNESS setting bar.	0x16	Yes	
23	Wireless channel		0x17	No	
24	Digital Zoom +	This button will show unsupported logo.	0x18	No	
25	Digital Zoom -	This button will show unsupported logo.	0x19	No	
26	Audio		0x1A	No	
27	PIP	Turns the PIP window on or off and makes related adjustments.	0x1B	Yes	SX930 not support this function
28	POP		0x1C	No	
29	PAP		0x1D	No	
30	Capture		0x1E	No	
31	S-video	Displays the S-VIDEO source selection.	0x1F	No	
32	Q?	Starts the INFORMATION function.	0x20	No	
33	Play/pause (iPhone)		0x21	No	
34	Next (iPhone)		0x22	No	
35	Prev. (iPhone)		0x23	No	
36	Menu/Back (iPhone)		0x24	No	
37	Timer on	When the presentation timer is off , this button will activate/ stop the timer. When the presentation timer is on , this button will restart, continue or turn off the timer.	0x25	No	
38	Timer Setup		0x26	No	
39	Scroll Up (iPhone)		0x27	No	
40	Scroll Down (iPhone)		0x28	No	
41	OK (iPhone)		0x29	No	
42	Lamp Mode	open “Lamp Menu” to select lamp mode.	0x30	Yes	
43	1		0x31	No	
44	2		0x32	No	
45	3		0x33	No	
46	4		0x34	No	
47	5		0x35	No	
48	6		0x36	No	
49	7		0x37	No	
50	8		0x38	No	
51	9		0x39	No	
52	0		0x3A	Yes	
53	RGBHV	Displays the PC source selection.	0x40	No	
54	RGB-PC1	Displays the PC 1 source selection.	0x41	Yes	
55	DVI-D	Displays the DVI-D source selection.	0x42	No	

56	DVI-A	Displays the DVI-A source selection.	0x43	No	
57	DVI-I	Displays the DVI-I source selection.	0x44	No	
58	RGB-PC2	Displays the PC 2 source selection.	0x45	Yes	SX930 not support this function
59	Network Display	Displays the LAN source selection.	0x46	No	
60	USB Display	Displays the mini USB source selection.	0x47	No	
61	USB Reader	Displays the USB disk source selection via type A USB port.	0x48	No	
62	Power Off	Turns off the projector.	0x4E	Yes	
63	Power On	Turns on the projector.	Ox4F	Yes	
64	Comp2	Displays the COMPONENT 2 source selection.	Ox50	Yes	SX930 not support this function
65	Comp1	Displays the COMPONENT 1 source selection.	0x51	Yes	
66	CVBS-1	Displays the CVBS-1 source selection.	0x52	No	
67	CVBS-2	Displays the CVBS-2 source selection.	0x53	No	
68	S-video2	Displays the S-Video 2 source selection.	0x54	No	
69	HDMI	Displays the HDMI source selection.	0x58	Yes	
70	HDMI2	Displays the HDMI source selection.	0x59	Yes	
71	GAMMA		0x5E	No	
72	COLOR TEMP		0x5F	No	
73	USB SETTING		0x60	No	
74	USB Up		0x61	No	
75	USB Down		0x62	No	
76	USB Left		0x63	No	
77	USB Right		0x64	No	
78	USB Select		0x65	No	
79	USB Return		0x66	No	
80	ANA	Selects the ANA aspect ratio.	0x70	No	
81	04:03	Selects the 4:3 aspect ratio.	0x71	No	
82	LB	Selects the LB aspect ratio.	0x72	No	
83	WIDE	Selects the WIDE aspect ratio.	0x73	No	
84	REAL	Selects the REAL aspect ratio.	0x74	No	
85	MEMORY1	Select the User memory settings.	0x75	No	
86	MEMORY2	Select the User memory settings.	0x76	No	
87	MEMORY3	Select the User memory settings.	0x77	No	
88	Default		0x78	No	
89	COLOR	Displays the COLOR setting bar.	0x79	No	
90	TINT	Displays the TINT setting bar.	0x7A	No	
91	ACTIVE		0x7B	No	
92	IRIS	Displays the setting bar for the adjustment of the motorised aperture lens IRIS.	0x7C	No	
93	Brilliant Color		0x7D	No	
94	SHARP		0x7E	No	
95	OVERSCAN		0x7F	No	
96	Memory	Select the User memory settings.	0x80	No	
97	Network		0x81	Yes	

	Setting				
98	Volume +	This button will magnify the volume gradually.	0x82	Yes	
99	Volume -	This button will reduce the volume gradually.	0x83	Yes	
100	Back	Goes back to previous OSD menu, exits and saves menu settings.	0x85	No	
101	Key Lock		0x87	No	
102	PAN		0x88	No	
103	Lens	Displays the setting page for the adjustment of the motorised vertical Lens shift value.	0x8A	No	
104	Focus		0x8B	No	
105	Zoom		0x8C	No	
106	V-keystone		0x8E	No	
107	H-keystone		0x8F	No	
108	PIP Size		0x90	No	
109	PIP Position		0x91	No	
110	Return		0x92	No	
111	My Screen		0x93	No	
112	Quick Install		0x94	Yes	
113	On(Split screen)		0x95	No	
114	Off(Split screen)		0x96	No	
115	Mic.Vol +		0x97	No	
116	Mic.Vol -		0x98	No	
117	SRS		0x99	No	
118	CC		0x9A	No	
119	Teaching Template		0x9B	No	
120	3D Menu		0x9C	No	
121	3D Sync Invert		0x9D	No	
122	Mouse Left		0x9E	No	
123	Mouse Right		0x9F	No	

Extra IR Function Code

NO	Customer Code	Data Code	Function	NO	Customer Code	Data Code	Function
1	0030	02FD	POWER	17	0030	26D9	TIMER SETUP
2	0030	1EE1	CAPTURE	18	0030	0FF0	MENU/EXIT
3	0030	13EC	ASPECT	19	0030	08F7	AUTO
4	0030	03FC	FREEZE	20	0030	0BF4	▲
5	0030	18E7	DIDITAL ZOOM+	21	0030	0DF2	◄
6	0030	16E9	BRIGHTNESS	22	0030	15EA	ENTER
7	0030	11EE	CONTRAST	23	0030	0EF1	►
8	0030	946B	TEST PATTERN	24	0030	0CF3	▼
9	0030	19E6	DIDITAL ZOOM-	25	0030	07F8	BLANK
10	0030	27D8	———	26	0030	04FB	SOURCE
11	0030	28D7	———	27	0030	827D	VOLUME+
12	0030	05FA	———	28	0030	14EB	MUTE
13	0030	25DA	TIMER ON	29	0030	837C	VOLUME-
14	0030	837C	———	30	0030	10EF	MODE
15			LASER	31	0030	29D6	———
16	0030	06F9	———	32	0030	30CF	———

2. RS-232 Command Code

For all application

Condition

1. Character delay=>0 ms
2. Stand by 0.5W and any baud rate don't loss command.
3. Test with Source in and no source
4. Test with Crestron control
5. Support volume bar display for volume command
6. Support Lan over Rs232 (no <CR> limitation)
7. Each input upper case and lower case character should be action)

(The response string will be in upper case)

(Version 13.5)

Function	Type	Operation	ASCII	Support
Power	Write	Power On	<CR>*pow=on#<CR>	Y
	Write	Power off	<CR>*pow=off#<CR>	Y
	Read	Power Status	<CR>*pow=?#<CR>	Y
Source Selection	Write	COMPUTER/YPbPr	<CR>*sour=RGB#<CR>	Y
	Write	COMPUTER 2/YPbPr2	<CR>*sour=RGB2#<CR>	N
	Write	COMPUTER 3/YPbPr3	<CR>*sour=RGB3#<CR>	N
	Write	Component	<CR>*sour=ypbr#<CR>	Y
	Write	Component2	<CR>*sour=ypbr2#<CR>	N
	Write	DVI-A	<CR>*sour=dviA#<CR>	N
	Write	DVI-D	<CR>*sour=dvid#<CR>	N
	Write	HDMI/MHL	<CR>*sour=hdmi#<CR>	Y
	Write	HDMI 2/MHL2	<CR>*sour=hdmi2#<CR>	Y
	Write	Composite	<CR>*sour=vid#<CR>	Y
	Write	S-Video	<CR>*sour=svid#<CR>	Y
	Write	Network	<CR>*sour=network#<CR>	N
	Write	USB Display	<CR>*sour=usbdisplay#<CR>	N
	Write	USB Reader	<CR>*sour=usbreader#<CR>	N
	Write	Wireless	<CR>*sour=wireless#<CR>	N
	Write	HDbaseT	<CR>*sour=hdbaset#<CR>	N
	Write	DisplayPort	<CR>*sour=dp#<CR>	N
	Read	Current source	<CR>*sour=?#<CR>	Y
Audio Control	Write	Mute On	<CR>*mute=on#<CR>	Y
	Write	Mute Off	<CR>*mute=off#<CR>	Y
	Read	Mute Status	<CR>*mute=?#<CR>	Y
	Write	Volume +	<CR>*vol=+#<CR>	Y
	Write	Volume -	<CR>*vol=-#<CR>	Y
	Read	Volume Status	<CR>*vol=?#<CR>	Y
	Write	Mic.Volume +	<CR>*micvol=+#<CR>	N
	Write	Mic.Volume -	<CR>*micvol=-#<CR>	N
	Read	Mic.Volume Status	<CR>*micvol=?#<CR>	N
Audio source select	Write	Audio pass Through off	<CR>*audiosour=off#<CR>	Y
	Write	Audio-Computer1	<CR>*audiosour=RGB#<CR>	Y
	Write	Audio-Computer2	<CR>*audiosour=RGB2#<CR>	N
	Write	Audio-Video/S-Video	<CR>*audiosour=vid#<CR>	Y
	Write	Audio-Component	<CR>*audiosour=ypbr#<CR>	N
	Write	Audio-HDMI	<CR>*audiosour=hdmi#<CR>	Y
	Write	Audio-HDMI2	<CR>*audiosour=hdmi2#<CR>	Y
	Read	Audio pass Status	<CR>*audiosour=?#<CR>	Y
Picture Mode	Write	Dynamic	<CR>*appmod=dynamic#<CR>	N
	Write	Presentation	<CR>*appmod=preset#<CR>	Y
	Write	sRGB	<CR>*appmod=srgb#<CR>	Y
	Write	Bright	<CR>*appmod=bright#<CR>	Y

	Write	Living Room	<CR>*appmod=livingroom#<CR>	N
	Write	Game	<CR>*appmod=game#<CR>	N
	Write	Cinema	<CR>*appmod=cine#<CR>	Y
	Write	Standard/Vivid	<CR>*appmod=std#<CR>	N
	Write	User1	<CR>*appmod=user1#<CR>	Y
	Write	User2	<CR>*appmod=user2#<CR>	Y
	Write	User3	<CR>*appmod=user3#<CR>	N
	Write	ISF Day	<CR>*appmod=isfday#<CR>	Y
	Write	ISF Night	<CR>*appmod=isfnight#<CR>	Y
	Write	3D	<CR>*appmod=threed#<CR>	N
	Read	Picture Mode	<CR>*appmod=?#<CR>	Y
Picture Setting	Write	Contrast +	<CR>*con=+#<CR>	Y
Picture Setting	Write	Contrast -	<CR>*con=-#<CR>	Y
Picture Setting	Read	Contrast value	<CR>*con=?#<CR>	Y
Picture Setting	Write	Brightness +	<CR>*bri=+#<CR>	Y
Picture Setting	Write	Brightness -	<CR>*bri=-#<CR>	Y
Picture Setting	Read	Brightness value	<CR>*bri=?#<CR>	Y
Picture Setting	Write	Color +	<CR>*color=+#<CR>	Y
Picture Setting	Write	Color -	<CR>*color=-#<CR>	Y
Picture Setting	Read	Color value	<CR>*color=?#<CR>	Y
Picture Setting	Write	Sharpness +	<CR>*sharp=+#<CR>	Y
Picture Setting	Write	Sharpness -	<CR>*sharp=-#<CR>	Y
Picture Setting	Read	Sharpness value	<CR>*sharp=?#<CR>	Y
Picture Setting	Write	Color Temperature-Warmer	<CR>*ct=warmer#<CR>	N
Picture Setting	Write	Color Temperature-Warm	<CR>*ct=warm#<CR>	Y
Picture Setting	Write	Color Temperature-Normal	<CR>*ct=normal#<CR>	Y
Picture Setting	Write	Color Temperature-Cool	<CR>*ct=cool#<CR>	Y
Picture Setting	Write	Color Temperature-Cooler	<CR>*ct=cooler#<CR>	N
Picture Setting	Write	Color Temperature-lamp native	<CR>*ct=native#<CR>	Y
Picture Setting	Read	Color Temperature Status	<CR>*ct=?#<CR>	Y
Picture Setting	Write	Aspect 4:3	<CR>*asp=4:3#<CR>	Y
Picture Setting	Write	Aspect 16:9	<CR>*asp=16:9#<CR>	Y
Picture Setting	Write	Aspect 16:6	<CR>*asp=16:6#<CR>	N
Picture Setting	Write	Aspect 16:10	<CR>*asp=16:10#<CR>	Y
Picture Setting	Write	Aspect Auto	<CR>*asp=AUTO#<CR>	Y
Picture Setting	Write	Aspect Real	<CR>*asp=REAL#<CR>	Y
Picture Setting	Write	Aspect Letterbox	<CR>*asp=LBOX#<CR>	N
Picture Setting	Write	Aspect Wide	<CR>*asp=WIDE#<CR>	N
Picture Setting	Write	Aspect Anamorphic	<CR>*asp=ANAM#<CR>	N
Picture Setting	Read	Aspect Status	<CR>*asp=?#<CR>	Y
Picture Setting	Write	Digital Zoom In	<CR>*zoomI#<CR>	N
Picture Setting	Write	Digital Zoom out	<CR>*zoomO#<CR>	N
Picture Setting	Write	Auto	<CR>*auto#<CR>	N
	Write	Brilliant color on	<CR>*BC=on#<CR>	Y
	Write	Brilliant color off	<CR>*BC=off#<CR>	Y
	Read	Brilliant color status	<CR>*BC=?#<CR>	Y
Operation Settings	Write	Projector Position-Front Table	<CR>*pp=FT#<CR>	Y
Operation Settings	Write	Projector Position-Rear Table	<CR>*pp=RE#<CR>	Y
Operation Settings	Write	Projector Position-Rear Ceiling	<CR>*pp=RC#<CR>	Y
Operation Settings	Write	Projector Position-Front Ceiling	<CR>*pp=FC#<CR>	Y

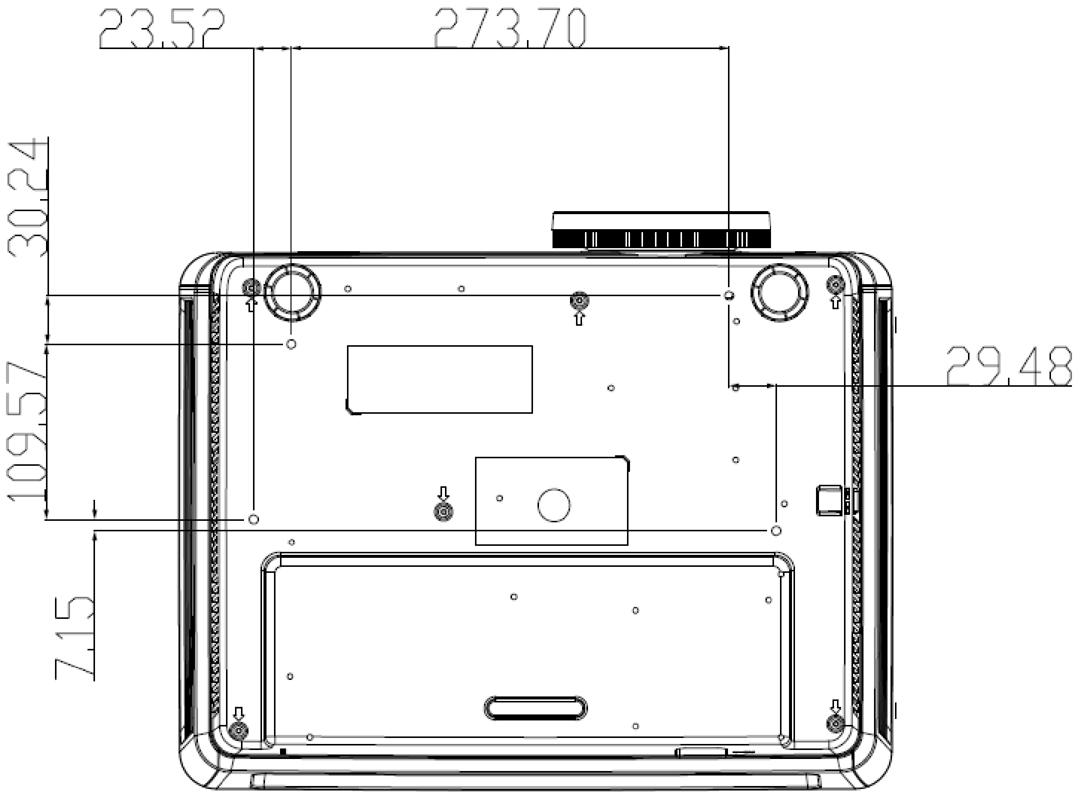
	Write	Quick auto search	<CR>*QAS=on#<CR>	Y
	Write	Quick auto search	<CR>*QAS=off#<CR>	Y
	Read	Quick auto search status	<CR>*QAS=?#<CR>	Y
	Read	Projector Position Status	<CR>*pp=?#<CR>	Y
	Write	Direct Power On-on	<CR>*directpower=on#<CR>	Y
	Write	Direct Power On-off	<CR>*directpower=off#<CR>	Y
	Read	Direct Power On-Status	<CR>*directpower=?#<CR>	Y
	Write	Signal Power On-on	<CR>*autopower=on#<CR>	Y
	Write	Signal Power On-off	<CR>*autopower=off#<CR>	Y
	Read	Signal Power On-Status	<CR>*autopower=?#<CR>	Y
	Write	Standby Settings-Network on	<CR>*standbynet=on#<CR>	Y
	Write	Standby Settings-Network off	<CR>*standbynet=off#<CR>	Y
	Read	Standby Settings-Network Status	<CR>*standbynet=?#<CR>	Y
	Write	Standby Settings-Microphone on	<CR>*standbymic=on#<CR>	N
	Write	Standby Settings-Microphone off	<CR>*standbymic=off#<CR>	N
	Read	Standby Settings-Microphone Status	<CR>*standbymic=?#<CR>	N
	Write	Standby Settings-Monitor Out on	<CR>*standbymnt=on#<CR>	Y
	Write	Standby Settings-Monitor Out off	<CR>*standbymnt=off#<CR>	Y
	Read	Standby Settings-Monitor Out Status	<CR>*standbymnt=?#<CR>	Y
Baud Rate	Write	2400	<CR>*baud=2400#<CR>	Y
	Write	4800	<CR>*baud=4800#<CR>	Y
	Write	9600	<CR>*baud=9600#<CR>	Y
	Write	14400	<CR>*baud=14400#<CR>	Y
	Write	19200	<CR>*baud=19200#<CR>	Y
	Write	38400	<CR>*baud=38400#<CR>	Y
	Write	57600	<CR>*baud=57600#<CR>	Y
	Write	115200	<CR>*baud=115200#<CR>	Y
	Read	Current Baud Rate	<CR>*baud=?#<CR>	Y
Lamp Control	Read	Lamp Hour	<CR>*ltim=?#<CR>	Y
	Read	Lamp2 Hour	<CR>*ltim2=?#<CR>	N
	Write	Normal mode	<CR>*lampm=lnor#<CR>	Y
	Write	Eco mode	<CR>*lampm=eco#<CR>	Y
	Write	Smart Eco mode(ImageCare)	<CR>*lampm=seco#<CR>	N
	Write	Smart Eco mode(LampCare)	<CR>*lampm=seco2#<CR>	N
	Write	Smart Eco mode(lumenCare)	<CR>*lampm=seco3#<CR>	N
	Write(dual lamp)	Dual Brightest	<CR>* lampm =dualbr#<CR>	N
	Write(dual lamp)	Dual Reliable	<CR>* lampm =dualre#<CR>	N
	Write(dual lamp)	Single Alternative	<CR>* lampm =single#<CR>	N
	Write(dual lamp)	Single Alternative Eco	<CR>* lampm =singleeco#<CR>	N
	Read	Lamp Mode Status	<CR>*lampm=?#<CR>	Y
Miscellaneous	Read	Model Name	<CR>*modelname=?#<CR>	Y
	Write	Blank On	<CR>*blank=on#<CR>	Y
	Write	Blank Off	<CR>*blank=off#<CR>	Y
	Read	Blank Status	<CR>*blank=?#<CR>	Y

	Write	Freeze On	<CR>*freeze=on#<CR>	Y
	Write	Freeze Off	<CR>*freeze=off#<CR>	Y
	Read	Freeze Status	<CR>*freeze=?#<CR>	Y
	Write	Menu On	<CR>*menu=on#<CR>	Y
	Write	Menu Off	<CR>*menu=off#<CR>	Y
	Write	Up	<CR>*up#<CR>	Y
	Write	Down	<CR>*down#<CR>	Y
	Write	Right	<CR>*right#<CR>	Y
	Write	Left	<CR>*left#<CR>	Y
	Write	Enter	<CR>*enter#<CR>	Y
	Write	3D Sync Off	<CR>*3d=off#<CR>	Y
	Write	3D Auto	<CR>*3d=auto#<CR>	Y
	Write	3D Sync Top Bottom	<CR>*3d=tb#<CR>	Y
	Write	3D Sync Frame Sequential	<CR>*3d=fs#<CR>	Y
	Write	3D Frame packing	<CR>*3d=fp#<CR>	Y
	Write	3D Side by side	<CR>*3d=sbs#<CR>	Y
	Write	3D inverter disable	<CR>*3d=da#<CR>	Y
	Write	3D inverter	<CR>*3d=iv#<CR>	Y
	Write	2D to 3D	<CR>*3d=2d3d#<CR>	N
	Write	3D nVIDIA	<CR>*3d=nvidia#<CR>	N
	Read	3D Sync Status	<CR>*3d=?#<CR>	Y
	Write	Remote Receiver-front+rear	<CR>*rr=fr#<CR>	Y
	Write	Remote Receiver-front	<CR>*rr=f#<CR>	Y
	Write	Remote Receiver-rear	<CR>*rr=r#<CR>	Y
	Write	Remote Receiver-top	<CR>*rr=t#<CR>	N
	Write	Remote Receiver-top+front	<CR>*rr=tf#<CR>	N
	Write	Remote Receiver-top+rear	<CR>*rr=tr#<CR>	N
	Read	Remote Receiver Status	<CR>*rr=?#<CR>	Y
	Write	Instant On-on	<CR>*ins=on#<CR>	N
	Write	Instant On-off	<CR>*ins=off#<CR>	N
	Read	Instant On Status	<CR>*ins=?#<CR>	N
	Write	Lamp Saver Mode-on	<CR>*lpsaver=on#<CR>	N
	Write	Lamp Saver Mode-off	<CR>*lpsaver=off#<CR>	N
	Read	Lamp Saver Mode Status	<CR>*lpsaver=?#<CR>	N
	Write	Projection Log In Code on	<CR>*prjlogincode=on#<CR>	N
	Write	Projection Log In Code off	<CR>*prjlogincode=off#<CR>	N
	Read	Projection Log In Code Status	<CR>*prjlogincode=?#<CR>	N
	Write	Broadcasting on	<CR>*broadcasting=on#<CR>	N
	Write	Broadcasting off	<CR>*broadcasting=off#<CR>	N
	Read	Broadcasting Status	<CR>*broadcasting=?<CR>	N
	Write	AMX Device Discovery-on	<CR>*amxdd=on#<CR>	Y
	Write	AMX Device Discovery-off	<CR>*amxdd=off#<CR>	Y
	Read	AMX Device Discovery Status	<CR>*amxdd=?#<CR>	Y
	Read	Mac Address	<CR>*macaddr=?#<CR>	Y
	Write	High Altitude mode on	<CR>*Highaltitude=on#<CR>	Y
	Write	High Altitude mode off	<CR>*Highaltitude=off#<CR>	Y
	Read	High Altitude mode status	<CR>*Highaltitude=?#<CR>	Y

DDC

D-Sub Analog EDID	HDMI-1 Digital EDID	HDMI-2 Digital EDID
00 FF FF FF FF FF FF 00 09 D1 03 11 01 00 00 00 1E 19 01 03 0E 00 00 78 0A 2C ED A3 5B 56 92 25 11 51 5A BD EF 80 81 C0 81 00 81 80 95 00 A9 40 D1 C0 61 7C 81 3C 64 19 00 40 41 00 26 30 18 88 36 00 00 00 00 00 00 18 00 00 00 FD 00 30 78 1F 66 11 00 0A 20 20 20 20 20 20 00 00 00 FE 00 42 45 4E 51 0A 20 20 20 20 20 20 20 20 00 00 00 FC 00 42 65 6E 51 20 50 4A 0A 20 20 20 20 20 00 99 6 BENQ SX930 ADT DSUB ddc2	00 FF FF FF FF FF FF 00 09 D1 03 11 01 00 00 00 1E 19 01 03 80 00 00 78 0A 2C ED A3 5B 56 92 25 11 51 5A BD EF 80 81 C0 81 00 81 80 95 00 A9 40 D1 C0 61 7C 81 3C 64 19 00 40 41 00 26 30 18 88 36 00 00 00 00 00 00 18 00 00 00 FD 00 17 78 0F 66 11 00 0A 20 20 20 20 20 20 00 00 00 FE 00 42 45 4E 51 0A 20 20 20 20 20 20 20 20 00 00 00 FC 00 42 65 6E 51 20 50 4A 0A 20 20 20 20 20 01 4F 02 03 3F 71 50 15 06 1F 10 03 84 05 11 13 14 02 12 20 21 22 01 23 09 07 07 83 01 00 00 7A 03 0C 00 10 00 38 2D 20 C0 10 01 40 01 2C 26 28 10 36 38 10 58 10 88 10 C8 10 E3 05 00 00 E2 00 FF 02 3A 80 18 71 38 2D 40 58 2C 45 00 00 00 00 00 00 1E 01 1D 80 18 71 1C 16 20 58 2C 25 00 00 00 00 00 00 9E 01 1D 00 BC 52 D0 1E 20 B8 28 55 40 00 00 00 00 00 1E 00 00 00 00 00 00 00 00 00 00 80 6 BENQ SX930 ADT HDMI1 ddc2	00 FF FF FF FF FF FF 00 09 D1 03 11 01 00 00 00 1E 19 01 03 80 00 00 78 0A 2C ED A3 5B 56 92 25 11 51 5A BD EF 80 81 C0 81 00 81 80 95 00 A9 40 D1 C0 61 7C 81 3C 64 19 00 40 41 00 26 30 18 88 36 00 00 00 00 00 00 18 00 00 00 FD 00 17 78 0F 66 11 00 0A 20 20 20 20 20 20 00 00 00 FE 00 42 45 4E 51 0A 20 20 20 20 20 20 20 20 00 00 00 FC 00 42 65 6E 51 20 50 4A 0A 20 20 20 20 20 01 4F 02 03 3F 71 50 15 06 1F 10 03 84 05 11 13 14 02 12 20 21 22 01 23 09 07 07 83 01 00 00 7A 03 0C 00 20 00 38 2D 20 C0 10 01 40 01 2C 26 28 10 36 38 10 58 10 88 10 C8 10 E3 05 00 00 E2 00 FF 02 3A 80 18 71 38 2D 40 58 2C 45 00 00 00 00 00 00 1E 01 1D 80 18 71 1C 16 20 58 2C 25 00 00 00 00 00 00 9E 01 1D 00 BC 52 D0 1E 20 B8 28 55 40 00 00 00 00 00 1E 00 00 00 00 00 00 00 00 00 00 70 6 BENQ SX930 ADT HDMI2 ddc2

Appendix 3 – Ceiling Mount Drawing



Appendix 4 - Optical Measurement

1. Scope:
This document describes critical optical related test definitions and Instructions for data or video projectors. The other general terminologies are specified in ANSI IT7.228-1997.

2. General Requirements

2.1. The unit under test should be allowed to stabilize without further adjustment for a minimum of 5 minutes, at nominal ambient room temperature of 25°C, before making measurements.

2.2. Measurements shall take place in a light proof room, where the only source of illumination is the projector. Less than 1 lux of the light on the screen shall be from any source other than the projector.

2.3. All measurements shall be made on flat screens that do not provide any advantage to the performance of the unit

2.4. All measurements shall be made at standard color temperature setting, 100% white image (per ANSI IT7.228-1997), except where noted

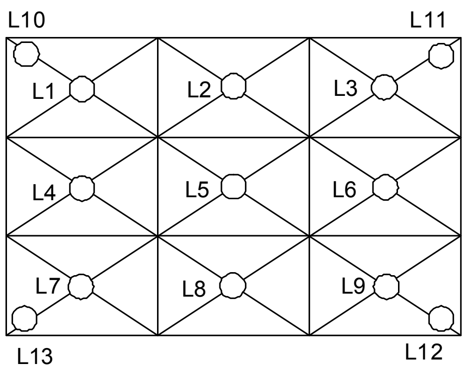
3. Practical Requirements

3.1. When measuring contrast manually, operators should not wear white clothing since light reflected from white clothing can influence the measurement.

3.2. Unless otherwise specified, the projection lens is set in the widest zoom position since zoom function can influence the measurement.

3.3. Measurement should be performed with Minolta Chromameter, Model CL-200, or equivalent.

A.1 ANSI BRIGHTNESS



ANSI Lumens = (L1+L2+L3+L4+L5+L6+L7+L8+L9)/9 (lux) x A (m^2)
A (Area) = W * H (m^2)
W: width of projected image (m)
H: height of projected image (m)

Note: L10, L11, L12, L13 are located at 10% of the distance from corner itself to L5

A.2 ANSI UNIFORMITY

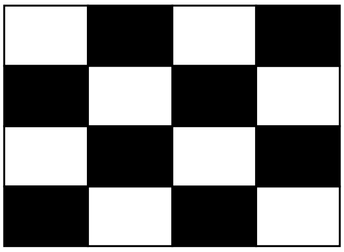
ANSI +Uniformity= [Maximum (L1~13)-Average (L1~9)]/ Average (L1~9)%
ANSI -Uniformity= [Minimum (L1~13)-Average (L1~9)]/ Average (L1~9)%

A.3 ISO UNIFORMITY

ISO Uniformity = Average (L1, L3, L7, L9)/ L5

A.4 ANSI CONTRAST

ANSI Contrast = Average lux value of the white rectangles/Average lux value of the black rectangles



Contrast Ratio shall be determined from illuminance values obtained from a black-and-white ”chessboard” pattern consisting of 16 equal rectangles. The white rectangles shall be at 100% gray and the black rectangles at 0% gray. Illuminance measurements shall be made at the center of each of the rectangles.

A.5 FOFO CONTRAST

FOFO Contrast = Lux value at the center of a solid white screen/the lux value at the center of a solid black screen

A.6 JBMA CONTRAST

JBMA Contrast = Average (L1,L2,L3,L4,L5,L6,L7,L8,L9) under solid white / Average (L1,L2,L3,L4,L5,L6,L7,L8,L9) under solid black

A.7 LIGHT LEAKAGE

Leakage = The maximum light leakage under a solid black pattern in or outside of the projected image

A.8 IMAGE DISTORTION

Keystone = $(W2-W1)/(W1+W2) \times 100\%$

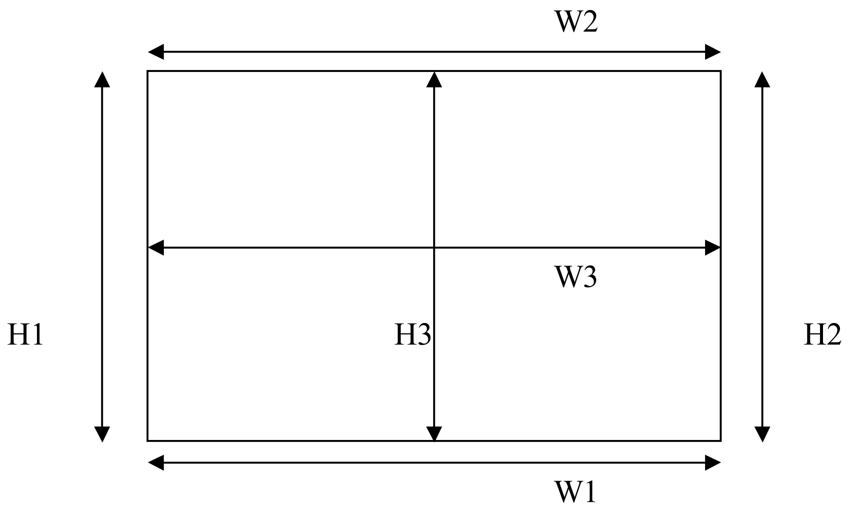
Vertical TV dist = $(H1+H2-2 \times H3)/2H2 \times 100\%$

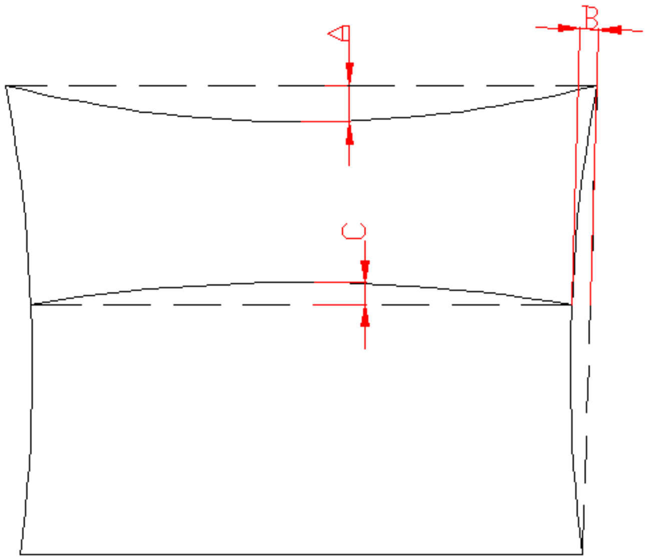
Horizontal TV dist = $(W1+W2-2 \times W3)/2W1 \times 100\%$

W1: image width at image bottom
W2: image width at image top
W3: image width at the half image height.
H1: image height at image left
H2: image height at image right
H3: image height at half image
Note:

1. Keystone and Vertical TV Distortion are recommended for Front Projection Display
2. Vertical and Horizontal TV Distortion are recommended for Rear Projection Display

Screen Distortion
A: Top of screen compared with idea linear horizontal line at top.
B: Left or right of screen compared with idea vertical line at left or right.
C: Center of screen compared with idea horizontal at center.
Note: Adjust W1=W2, H1=H2, then measure A/B/C as the following drawing





A.9 THROW RATIO
Throw ratio = projection distance / the width of the projected image

A.10 ZOOM RATIO
Zoom ratio = maximum / minimum image diagonal size at a fixed projection distance

A.11 FOCUS RANGE
The minimum/maximum focus distance is the minimum/maximum projection distance (The distance between the outermost element of projection lens and screen), expressed in meter, at which the image is still at its acceptable focus level.(acceptable focus level is specified by FOCUS LIMIT SAMPLE approved by customer)

A.12 COLOR
Color is expressed as (x, y) in 1931CIE chromaticity values
Note: Color is measured at the center of the screen that is entirely the measured color under default brightness and contrast settings

A.13 ANSI COLOR
ANSI Color is expressed as (u, v) in 1976 CIE chromaticity values
Note: Color is measured at the center of the screen that is entirely the measured color under default brightness and contrast settings.

A.14 COLOR UNIFORMITY

Color Uniformity: ∆u'v'= [(u'1-u'0)^2+(v'1-v'0)^2]^1/2

(u'0,v'0): the average color of L1~L9

(u'1,v'1): the max deviation of L1~L13

A.15 PROJECTION OFFSET

Projection Offset (Vertical)

Mode A= $\frac{\frac{1}{2}h+\Delta h}{\frac{1}{2}h}$ x 100%

Mode B= $\frac{h+\Delta h}{h}$x 100%

Mode C= $\frac{\Delta h'}{h}$ x 100%, where as $\Delta h' = \Delta h + \frac{1}{2}h$

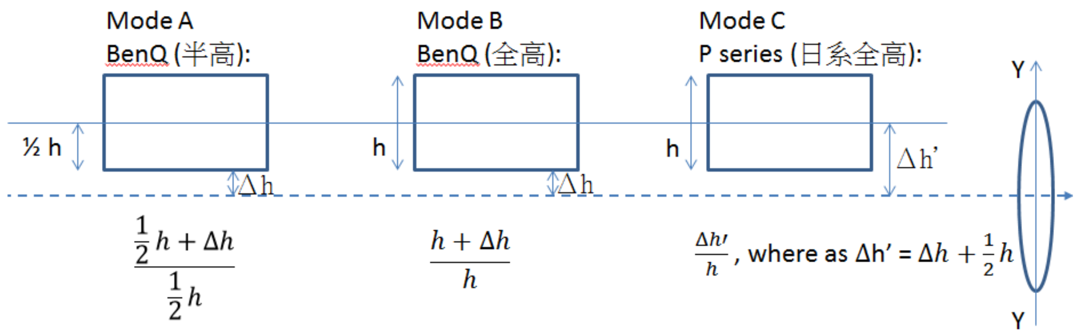
h=Half image height ;

∆h= Distance between bottom of image above projection lens optical axis

∆h'= Distance between Center of image above projection lens optical axis

Note: Measurement based on screen keystone within spec. condition.

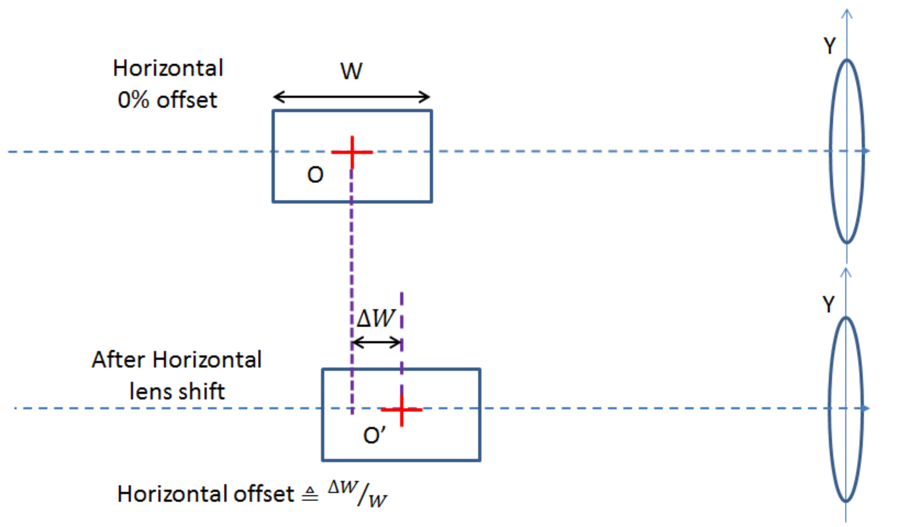
Vertical Offset definition



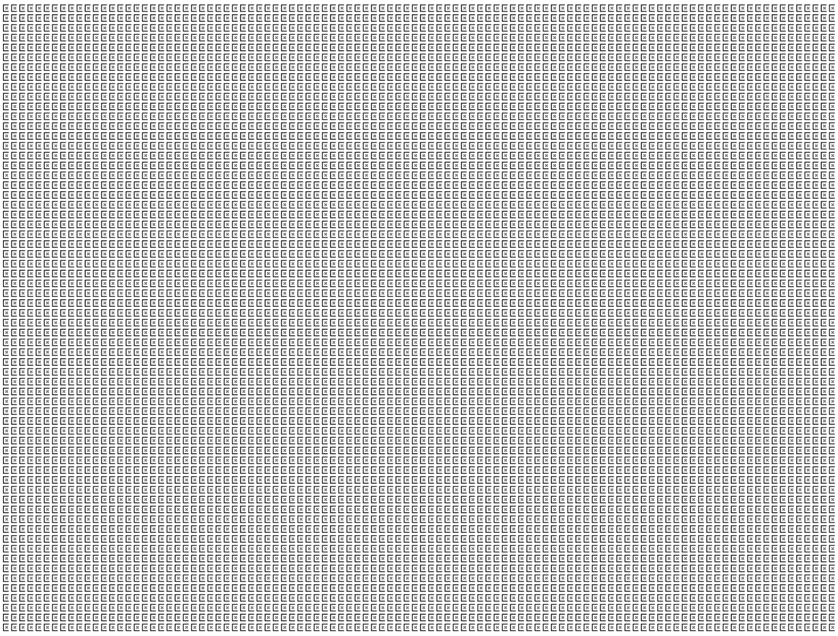
Projection Offset (Vertical)

Horizontal offset $\triangleq \Delta W/W$

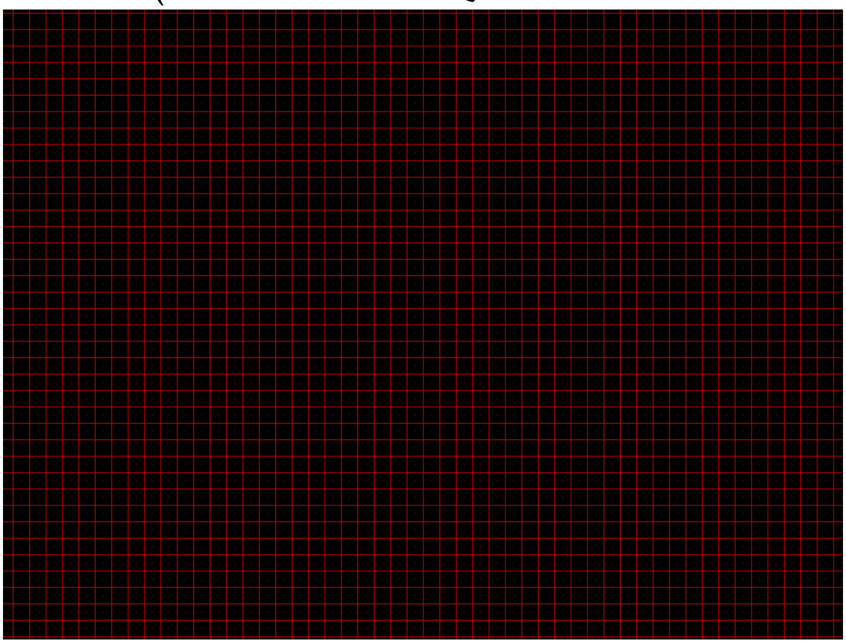
Horizontal Offset definition



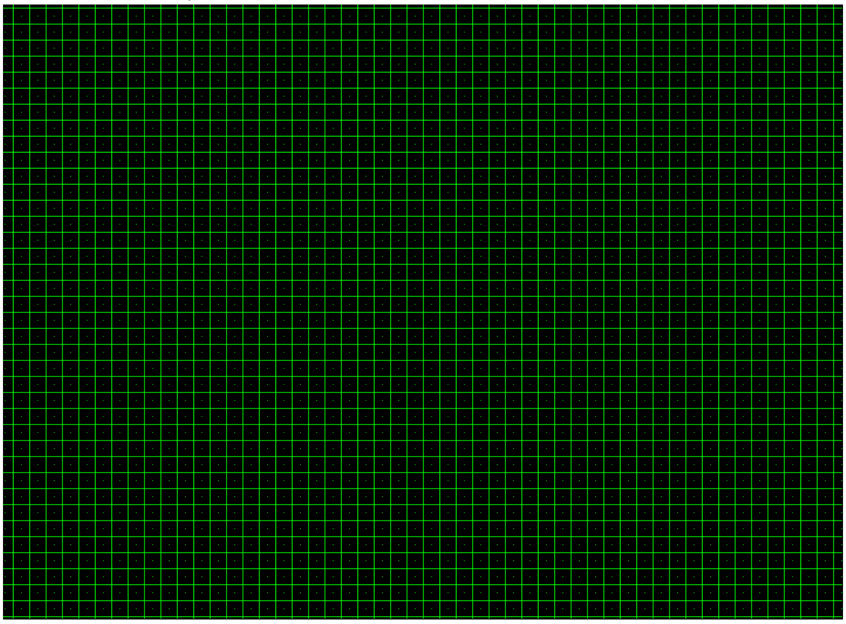
Pattern 1 (☒ Pattern; Please contact BenQ for file with correct resolution)



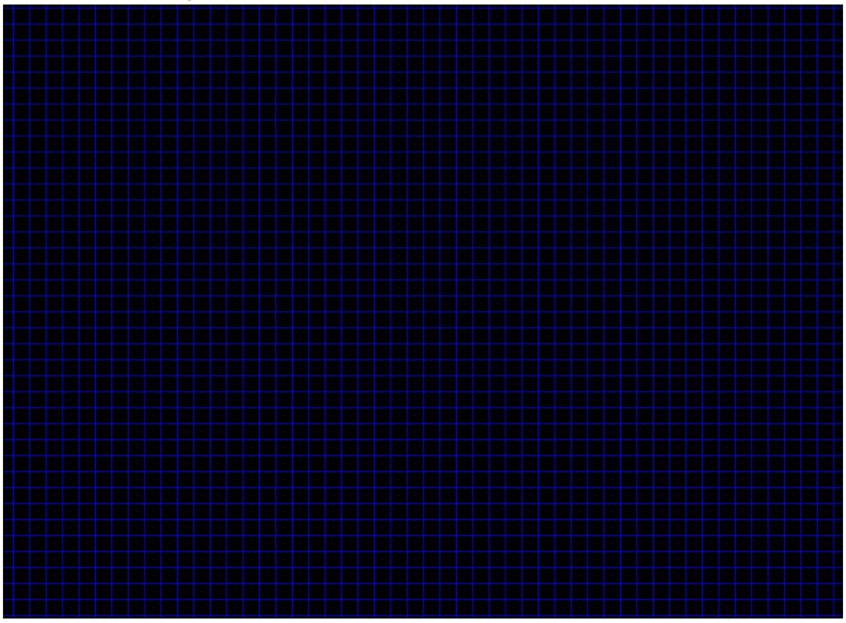
Pattern 2 (Please contact BenQ for file with correct resolution)



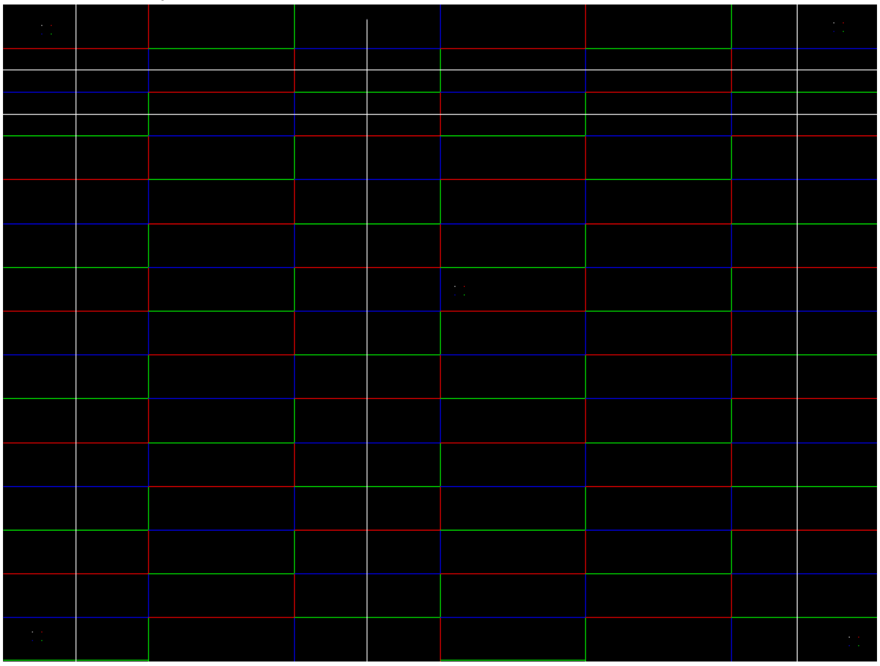
Pattern 3 (Please contact BenQ for file with correct resolution)



Pattern 4 (Please contact BenQ for file with correct resolution)



Pattern 5 (Please contact BenQ for file with correct resolution)



Pattern 6 (Please contact Qisda RD for file with correct resolution)

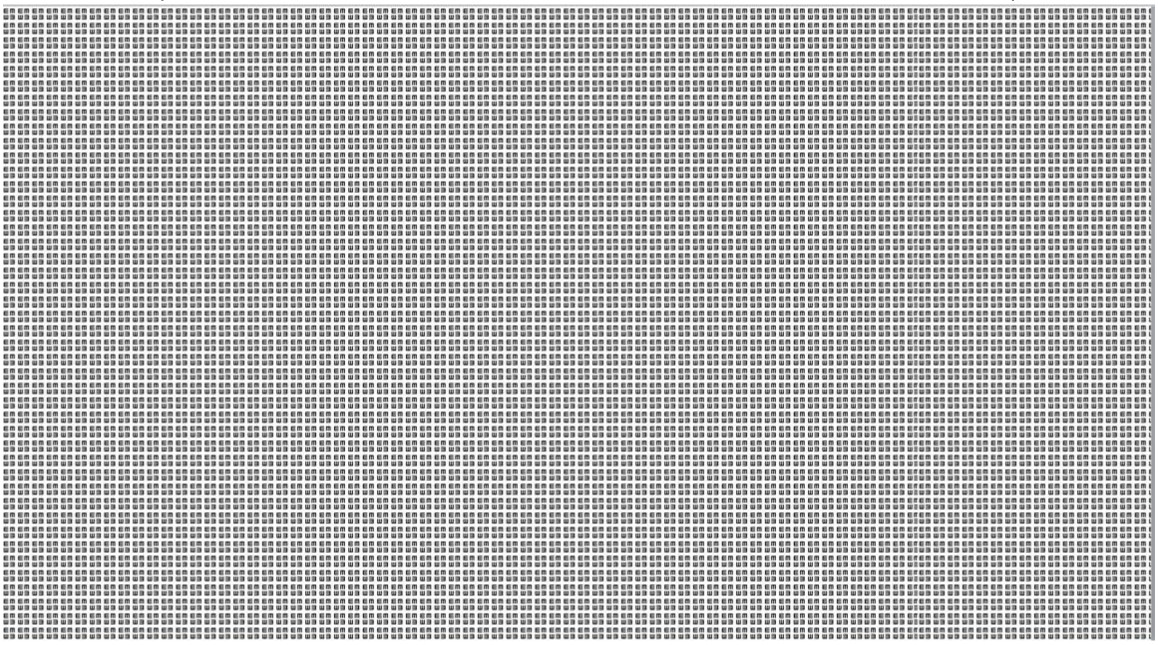
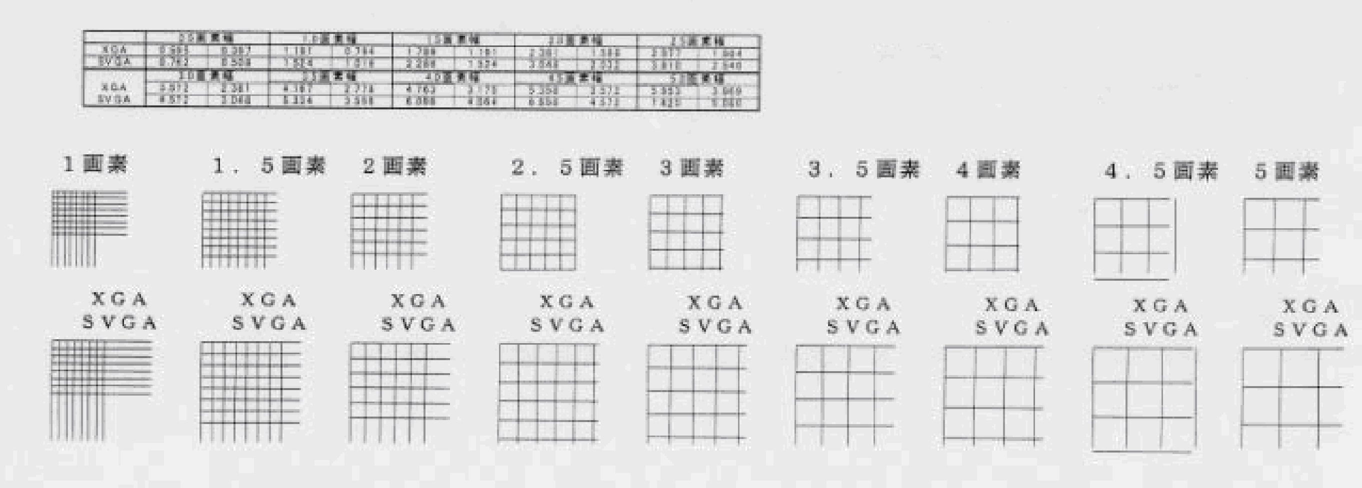


Chart 1 Example of Pixel Testing Pattern (60" screen size)



A.16 Defocus and Flare Test Procedure

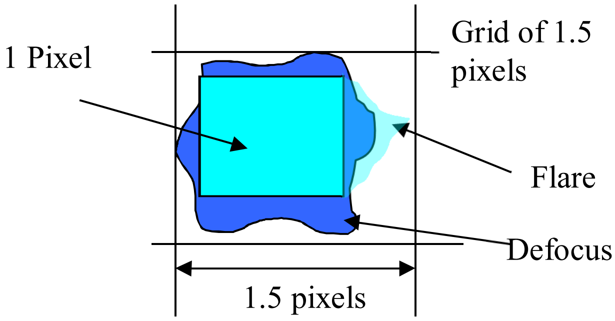
Procedure:

Step 1: Get best focus image (best uniform) with **Pattern1**

Step 2: Check specified screen sizes and zoom positions

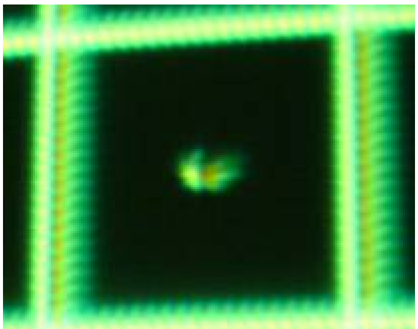
Step 3: Use **Chart1** to measure defocus and flare of R,G,B color at **Pattern 2,3,4**

Example of 1.5 pixel flare:



Remark:

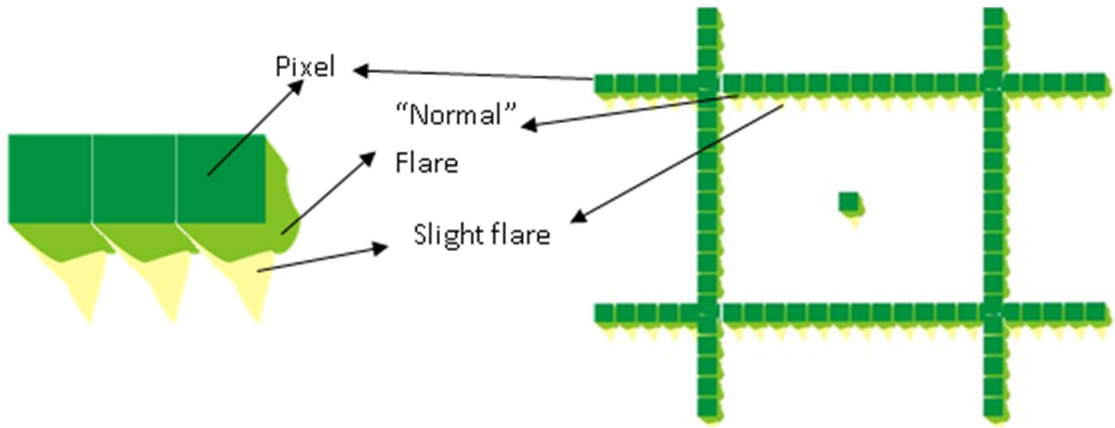
1.Abnormal focus: Example: double pixel



A.17 Definition of "Slight flare"

Slight flare is observed with following steps:

1. Slight flare is measured with the "Line" in pattern "Cross hatch with dots"
2. A slight flare is defined as flare with very faint brightness compares to "Normal Flare" in "Line". Please refer to the drawing below:
3. To use 50% ND filter for slight flare judgment.(Except defocus/flare spec 3/4)
4. Slight Flare is not accounted as flare. (Except defocus/flare spec 3/4)



A.18 Lateral Color Test Procedure

Procedure:

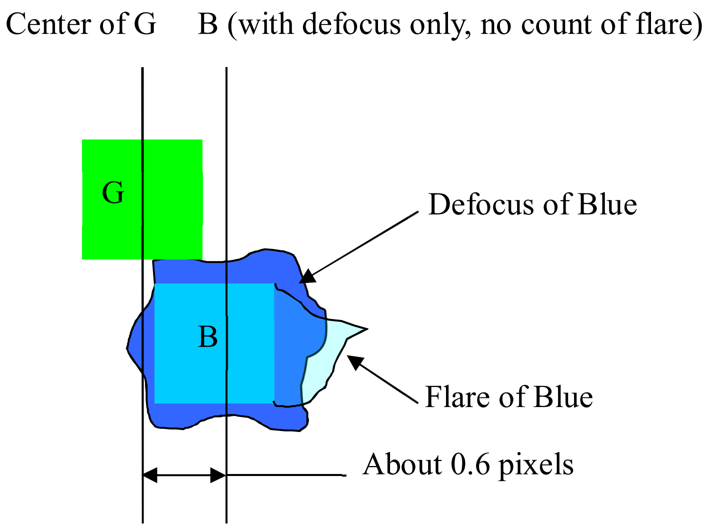
Step 1: Get best focus image (best uniform) with **Pattern 1**

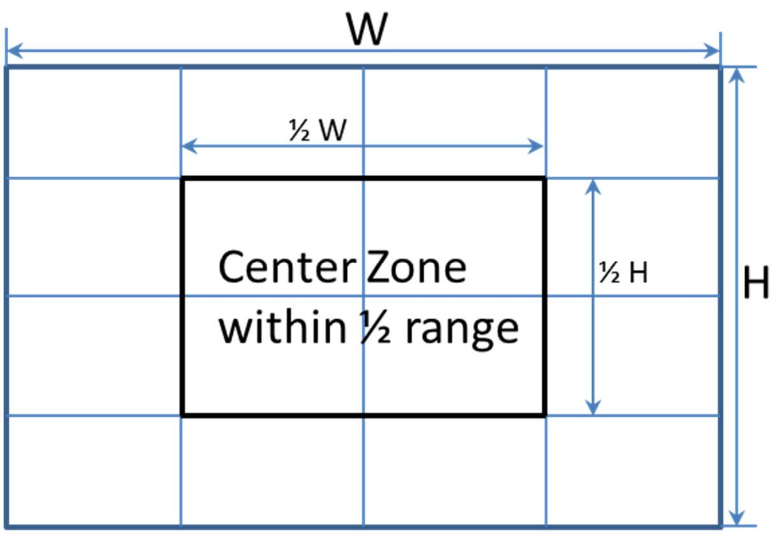
Step 2: Check specified screen sizes and zoom positions

Step 3: Use **Chart1** to measure Lateral Color at **Pattern 5**

Center Zone define as picture "center zone"

Example if 0.6 pixel lateral color:





A.19 Lamp Lifetime Test Procedure

50% lamp brightness maintenance under 2hr ON, 15min OFF cycling test

A.20 Ghost Contrast Ratio Test Procedure
Step1. Measure the brightness from the center of pattern
Step2. Measure the max brightness from the ghost image
Step3. $Contrast_ratio = \frac{L_{(Center_of_Pattern)}}{L_{(Max_of_ghost)}}$



A.21 Center Position Shift (W-T) Test Procedure
Step1. Adjust zoom the WIDE and adjust the focus of center screen to the best and mark on the center.
Step2. Adjust zoom the TELE and adjust the focus of center screen to the best and mark on the center.
Step3. Measure the deviation of two center.

A.22 Full Dark Uniformity
Step1. Choose the full dark pattern and measure 13 points X,Y,Z.
Step2. Convert X,Y,Z to L,a,b
Step3. $\Delta E = \sqrt{(L1 - L2)^2 + (a1 - a2)^2 + (b1 - b2)^2}$

A.23 WCE3 measurement limit condition
When input source pattern from White to Black or Black to White need wait 20 sec after to measure WCE3 Contrast. The Diming Gain is xxx for measurement in production line.

A.24 Depth of Focus(DOF) Procedure
Procedure:
Step 1: Check specified screen sizes and zoom position (Wide)
Step 2: Get best focus image (best uniform) with **Pattern1**
Step 3: Use **E pattern** to check the depth of focus, move projector forward to close to the screen and until E pattern became focus limit. Record the forward distance(+) for the front depth of focus. Or move projector backward to far away the screen and until E pattern became focus limit. Record the backward distance(-) for the rear depth of focus.

A.25 Focus Drift and Thermal Reliability Test
A.25.1 Lens Focus (Thermal) Drift Test:
1. Purpose: To Verify Projection Lens Focus Stability with Projector Burn-in Process
2. Test Procedure:

2-1. Projector Focus adjusted to "best uniform" within 3 min. after power on. (zoom/focus positions are fixed throughout the test)
2-2. Projector Focus Quality Test at initial power on (tests shall be done within 3 min. after power on)
2-3. The burning period to use the Full white pattern in Default mode.
2-4. Projector Focus Quality Test after power on for 30 min
2-5. After cooling 1 hrs without any focus adjustment and re-turn on to do the Projector Focus Quality Test from 3min. to 30min. at initial power on .
3. Test Setup:
3-1. Projectors used for this test should be kept non-operated for at least 1 hour under room temperature.
3-2. Focus Quality Test:

1) Focus Test Setup: Follow B201 definition (throw distance, image size)
2) Test Items: Focus Pattern 区 Pattern, Defocus, Flare,(E pattern for Specific lens)

4. Judgment Criteria: Test results satisfied below conditions will be judged as "Pass".
4-1. Focus Pattern(區 pattern) judgment remained OK. (If pattern can be focused, then pass! If dubitable, check 4-2, 4-3)
4-2. Defocus/Flare deviation ≦ 1.0 pixels while comparing measured values of "Initial" vs. "30 min. after power on".
4-3 Defocus/Flare: Don't allow double pixel after thermal Drift.
4-4 Regarding Specific lens, if the area can't pass 4-1, please change to E pattern and compare to E pattern limit sample. If the clear status is not worse than E pattern limit sample, it pass.

Note:
2-1 ~ 2-4: 冷開機調整測試
2-5 focus drift recycle 測試

Specific Lens List as below:

1. UST2/UST3
2. Zoom1 for XGA/WXGA

A.25.2 Projection Lens Thermal Reliability Test (熱變異測試)::
1. Purpose: To Verify Projection Lens (Focus) Quality with Baking Process
2. Test Procedure:
2-1. Focus Quality Test Before Baking
2-2 Baking Process
2-2. Focus Quality Test After Baking
3. Test Setup:
3-1. Baking Process

1) Condition: 60℃ x 48hrs
2) Projection Lens FAI Stage: Lens units Baking Only (Min. 14pcs)
3) RD EVT Stage: Projector Baking (Min. 2 units)

3-2. Focus Quality Test:

1) Focus Test Setup: Follow B201 definition (throw distance, image size)
2) Test Items: Focus Pattern(区 Pattern), Defocus, Flare

4. Judgment Criteria: Test results satisfied below conditions will be judged as "Pass".
4-1. Focus Pattern judgment remained OK. (Criteria follow B201)
4-2 Defocus/Flare deviation ≦ 1.0 pixel comparing measured values of "After" vs. "Before" Baking Process.

Appendix 6 - Design Verification Test Procedure

B.1 Purpose

This standard establishes the environmental specification for projector related products, which defines the level of product performance and reliability in the field. It is not necessary the intent of these specification to simulate a typical user environment, but rather to provide for a level of product robustness that when applied over a wide range of manufacturing variability and environmental usage conditions, which is recommended for product assurance testing reference.

B.2 Test Summary

<table>
<tr><th>B2.1 Dynamic Test</th><th>Specification</th></tr>
<tr><td>Package Drop</td><td>
<table>
<tr><td colspan="4">Drop test with packing gross weight and falling height relationship</td></tr>
<tr><td>Gross Weight</td><td colspan="3">Falling Height (cm) Spec.</td></tr>
<tr><td>(Kg)</td><td colspan="2">Q30</td><td>Q40/Q50/MP</td></tr>
<tr><td>0.0<W<4.5</td><td>91</td><td>(106)</td><td>91</td></tr>
<tr><td>4.5≦W<11.0</td><td>91</td><td>(106)</td><td>91</td></tr>
<tr><td>11.0≦W<20.5</td><td>76</td><td>(91)</td><td>76</td></tr>
<tr><td>20.5≦W<34.0</td><td>61</td><td>(76)</td><td>61</td></tr>
<tr><td>34.0≦W<45.5</td><td>46</td><td>(61)</td><td>46</td></tr>
<tr><td>45.5≦W<79.4</td><td>31</td><td>(4)</td><td>31</td></tr>
<tr><td>Criteria</td><td>*A</td><td>*B</td><td></td></tr>
<tr><td colspan="4">Test Orientation: 1 corner, 3 edges, 6 faces
Criteria:
1. Criterion *A: After testing, no abnormality on function and appearance, brightness and uniformity deviation must be within +/- 5%.
2. Criterion *B: After testing, no abnormality on function and appearance. (This is tightened spec to double check design margin on R&D stage only.)
3. No broken issue on carton.
4. No broken issue on cushion, but cracks acceptable.</td></tr>
</table>
</td></tr>
<tr><td>Package Vibration</td><td>Test condition :
1. Sine wave:
5~200Hz 1.5G, 1 octave/min, 15 min dwell on each resonant frequency, all primary axis, one sweep 30 minutes/Min. per orientation, total of 90+ min.
2. Random wave:
5-100Hz 0dB/Oct. 0.015(g2/Hz)
100-200Hz -6dB/Oct. N/A
200Hz N/A 0.0038(g^2/Hz)
Equivalent to 1.47 Grms, all primary axes, 20 min per-orientation, total of 60 min.
Note: Perform random vibration test before, the Sine-wave vibration should be done first.</td></tr>
<tr><td>Un-package Vibration
(Non-operating)</td><td>Test Spectrum
Frequency Hz Spectrum Level (g2/Hz)</td></tr>
</table>

	20 ~ 200 0.0185 Duration : 5 Minutes Axis : 3 axis (Horizontal and Vertical axis ,Z axis) Duration: 5 minutes per orientation, totally 15 minutes.	
Un-package Shock (Non-operating)	Waveform: Half sine Faces: 6 sides/per orientation, 3 shocks Duration: < 20 ms Velocity accelerate: 50 G	
Bench Drop	1. Pivot, 90 degree, sitting on right and left side, 1 drop per orientation, total of 2 drops. 2. Bottom and opposite, 1 drop per orientation, drop height 5 cm, totally 2 drops.	
Security Lock	20kg break away force	
B2.2 Atmospherics Test		
Temperature/Humidity, (Operating)	Test condition: 0℃~ 40℃, 10%~90%, no condensation Test procedure: 25℃/90%, 2hrs → 40℃/90%, 6hrs → 0℃, 6hrs → 40℃/10%, 6hrs → 25℃/90%, 2hrs; (2 Cycles)	
Storage High Temperature / Humidity (Non-operating, with package)	Test condition: (-20°C ~ 60°C, 10% ~ 90% R.H.) 1. Storage high temperature / humidity exposure test: 25℃/60%, 1hrs → 60℃/90%, 48hrs → 25℃/60%, 1hrs 2. Storage transportation test: 25℃/60%, 1hrs → -20℃, 24hrs → 25℃/60%, 1hrs → 60℃/90%, 24hrs → 25℃/60%, 1 hrs Criteria Inspection: 1. The products should be operated normally at specified lower and higher temperature environment. 2. The carton no crash and broken issue.	
Altitude	Operating: Without high altitude mode 0°C~35°C @ 0~1499m above sea level With high altitude mode 0°C~30°C @ 1500~3000m above sea level Non-operating: 30℃@0~12,200m above sea level	
Start	Turn On @ 0℃ and 40℃, AC90~264V, 47~63Hz	
B2.3 Regulatory		
EMC	Test condition: FCC part 15B class B, EN55022 class B	
ESD	Follow IEC 61000-4-2 and EN55024 regulation 1. Input Voltage / Frequency : 110V AC / 60Hz 2. Timing Mode : 48K/72Hz, Full White Pattern	
ESD : Air	Air discharge to set surface: ±15KV	No Damage
ESD : Contact	Contact discharge to set surface and metal: ±8KV	No Damage
	Contact discharge to Vert./Horiztl coupling plane: ±8KV	No Damage
	Contact discharge to D-sub/S-video input pins: ±4KV	No Error
	Contact discharge to HDMI input pins: ±2KV	No Error
Surge	1KV line to line, 2KV line to ground on input power lines.	
Safety	Please refer to IEC/EN/UL 60950-1 for details.	

B.3 Failure Criteria

The product is expected to perform to its full potential without loss of function, performance, critical parametric changes, and other undesirable anomalies, over the applied boundaries of this specification. The following product failure is not allowed within the boundaries defined in this specification:

1. Failure including permanent damage, critical paramedics changes (optical performance defined in Appendix A), and latent defects.
2. Failure requiring operator intervention.
3. Failure violating external laws, regulatory agency standards, and government directives.
4. Failure resulting in a safety, potential safety, issue.

Appendix 7 - Thermal and Noise Test Procedure

C.1 Noise Testing Standard

(1) Test Standard : ISO 7779:1999 "Acoustics-Measurement of Airborne Emitted by Information Technology and Telecommunications Equipment".

(2) Projector Position: On the center of standard desk.

(3) The background noise level when EUT is not operating should < 19dB.

(4) The sound level meter parameter by setting the following :

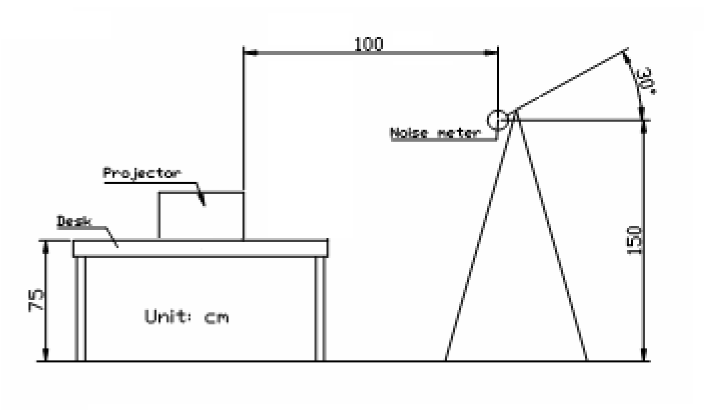
Function	Setting
Display	SPL (sound pressure level)
Frequency Weighting	A

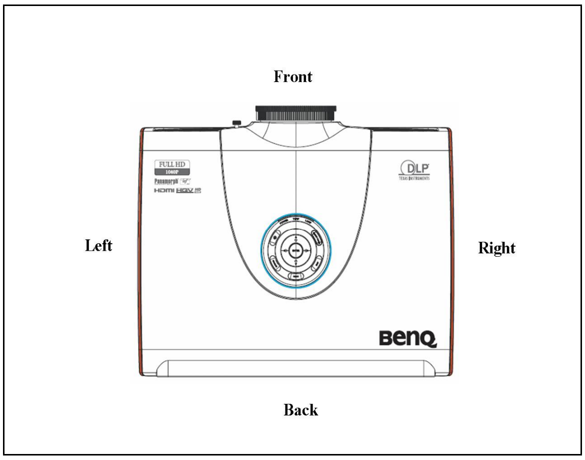
(5) Turn on the power of the EUT and allow the system to warm-up for 30 minutes at least.

(6) For the operating mode, Record the highest reading of the sound level meter during the period.

(7) Record values of 4 orientations (Front, Right, Back, Left shown as below picture. These four data must be measured at the same time.) and then weighting as below formula:

$$\text{Acoustic Noise Weighting} = 10 \times \log\left(\frac{10^{\frac{Front}{10}} + 10^{\frac{Right}{10}} + 10^{\frac{Back}{10}} + 10^{\frac{Left}{10}}}{4}\right)$$





C.2 Exhausted Air Test Procedure:

Exhausted Air<95 °C, measurement position shown as follows:

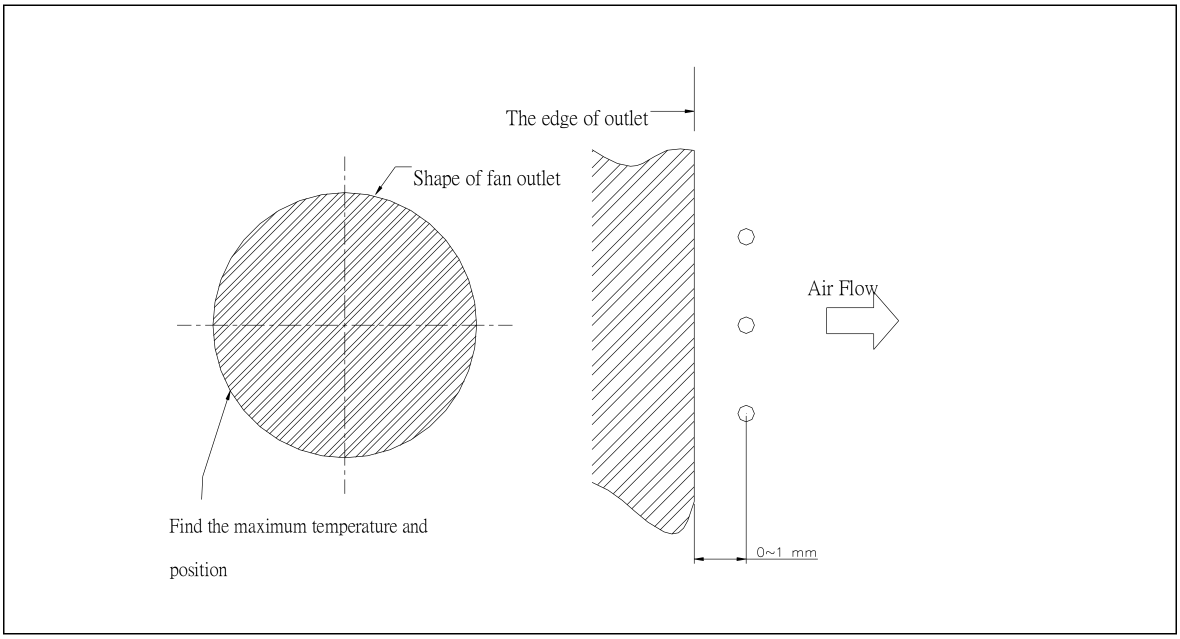


Figure : measurement position.

C.3 Temperature of System Level：

Before measurement temperature, please use IR camera to make sure the position of hot spot. We defined maximum temperature and measurement position as following：

Area	Define	Spec. Maximum	
		metal℃	plastic℃
Surface which may be touched	All surface	70	95
Surface held or touched for short periods	Key pad, Adjustment foot/lens, side surface	60	85
Bottom surface	Lamp cover	55	70
Outlet surface	Mesh surface	70	95

Appendix D DMD Image Quality

1. Scope

This document specifies the image quality requirements applicable to the DLP®.7XGA Type A and Series 450 Value Component Set. The Component Set provides the DLP®. 7XGA Type A and Series 450 Value Projector with digital imaging functionality based on Digital Micromirror Device (DMD) technology.

2. Definitions: (Defects and Test Screens)

Blemish

A blemish is an obstruction, reflection, or refraction of light that is visible, but out of focus in the projected image under specified conditions of inspection (see Table 1). It is caused by a particle, scratch, or other artifact located in the image illumination path.

Dark pixel

A single pixel or mirror that is stuck in the OFF position and visibly darker than the surrounding pixels.

Bright pixel

A single pixel or mirror that is stuck in the ON position and visibly brighter than the surrounding pixels.

Unstable pixel

A single pixel or mirror that does not operate in sequence with parameters loaded into memory. The unstable pixel appears to be flickering asynchronously with the image.

Adjacent pixel

Two or more stuck pixels sharing a common border or common point, also referred to as a cluster.

Row or Column Defect

The reset boundary artifact is a single row of pixels on the reset group boundaries that are visibly darker or lighter than the neighboring rows of pixels.

Pond of Mirrors (POM)

POM is a rectangular array of off-state mirrors surrounding the active area.

Eyecatcher

Eyecatcher's are blemishes appearing in the area outside of the Active Area. These are due to particles and various DMD window or window aperture "defects" including: digs, voids, and scratches.

Border Artifacts

Border artifacts are a general category of image artifacts that may show up on screen in the area outside of the active array. Border artifacts include: Exposed Bond Wires, Exposed Metal 2, and Reflective Edge.

Bond Wires

Bond Wires are the electrical connections between the die and the DMD ceramic package. If visible, they will appear as short light parallel lines outside of the Pond of Mirrors (POM).

Exposed Metal 2

Exposed Metal 2 is due to a shift in positioning of either the die or the window aperture, which may allow light to be reflected off of the layer of metal 2 that is below the super structure (mirrors). This defect is located outside of the POM.

Reflective Edge

Reflective Edge is light that may reflect from the edge of the DMD window aperture onto the projection screen. It will appear as a thin diffuse line outside of the POM.

Blue 60 Screen

The Blue 60 screen is used to test for major dark blemishes. All areas of the screen are colored a Microsoft Paintbrush blue 60 (green and red set at 0, blue set at 60). NOTE: If linear degamma is not used then the Microsoft Paintbrush values must be adjusted to match the degamma table being used

in order to generate an equivalent blue level on the test screen image.

Gray 10 Screen

The Gray 10 screen is used to test for major light blemishes. All areas of the screen are colored a Microsoft Paintbrush gray 10 (green, red, and blue set at 10).

NOTE: If linear degamma is not used then the Microsoft Paintbrush values must be adjusted to match the degamma table being used in order to generate an equivalent gray level on the test screen image.

Gray 30 Screen

The Gray 30 screen is used to test for the reset boundary artifact. All areas of the screen are colored a Microsoft Paintbrush gray 30 (green, red, and blue set at 30).

NOTE: If linear degamma is not used then the Microsoft Paintbrush values must be adjusted to match the degamma table being used in order to generate an equivalent gray level on the test screen image.

3. ACCEPTANCE REQUIREMENTS

3.1 Conditions of Acceptance

All DMD image quality returns will be evaluated using the following projected image test conditions:

Test Set degamma shall be linear.

Test Set brightness and contrast settings shall be set to nominal.

The diagonal size of the projected image shall be a minimum of 60 inches.

The projection screen shall be 1X gain.

The projected image shall be inspected from an 8 feet minimum viewing distance.

The image shall be in focus during all Table 1 tests.

3.2 Test Sequence

Tests shall be run in the sequence listed in Table 1.

Table 1. Image Quality Specification

SEQ#	Test	SCREEN	ACCEPTANCE CRITERIA
1	Major Dark Blemish	Blue 60	1. ≦4 visible dark blemishes are allowed in the active area 2. No blemish will be ＞1.5" long/diameter
2	Major Light Blemish	Gray 10	1. ≦4 visible dark blemishes are allowed in the active area 2. No blemish will be ＞1.5" long/diameter
3	Reset Boundary Artifact	Gray 30	No reset boundary artifacts allowed
4	Eyecatchers / Border Artifacts	Any screen	Eyecatcher and border artifacts are allowed
5	Projected Images	1. Any screen 2. Gray 10 3. Any screen 4. Gray 10 5. Whit 6. Any screen 7. Any screen	1. No adjacent pixels 2. No bright pixels in Active Area 3. No unstable Pixels in Active Area 4. ≦ 1 right pixel in the POM 5. ≦ 4 dark pixels in the Active Area 6. No DMD window aperture shadowing on the Active Area 7. Minor blemishes are allowed

Notes:

6. Projected blemish numbers include the count for the shadow of the window artifact in addition to the artifact itself.
7. During all Table 1 tests, projected images shall be inspected in accordance with the conditions of inspection specified in Section 3.
8. The rejection basis for all cosmetic DMD defects (scratches, nicks, particles) will be the

projected image tests referenced in Table 1.

9. Devices that meet this image quality specification but are deemed undesirable by the customer may not be returned to TI without prior approval by TI.
10. Screens < Gray 10 shall not be used as a basis for rejecting a DMD for image quality.

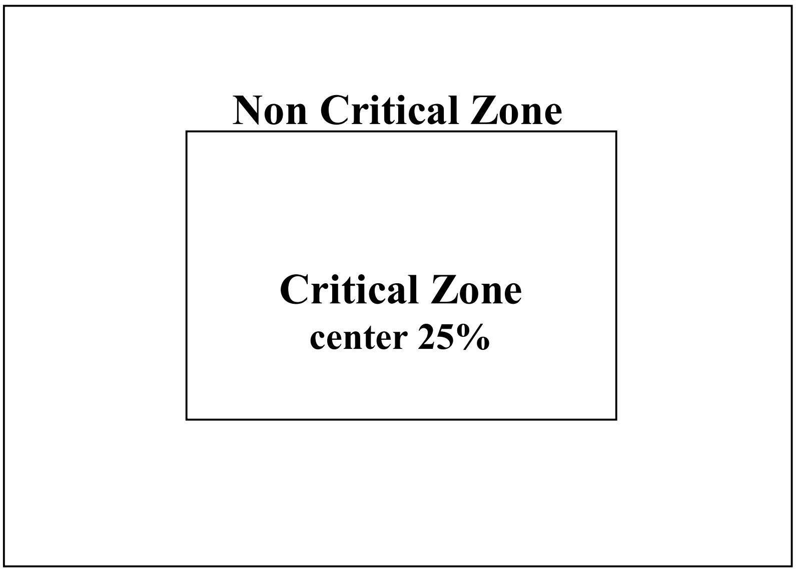


Figure1. Major Blemish Two Zone Screen